ECONOMIC ANALYSIS OF SCALING UP HIV PREVENTION INTERVENTIONS IN SOUTHERN INDIA

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To John and Thomas

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Abstract

This thesis explores the impact of scale on the costs of HIV prevention interventions and the contractual relationships between governments and NGOs in two Southern Indian states. Evidence on the resources required and organisational structures for scaling up health interventions efficiently in low income countries is scarce. The Indian National AIDS Control Programme (NACP) is tackling the largest HIV epidemic in the world. Between 1998 and 2004 the NACP, through state level AIDS programmes, scaled up contracting with NGOs delivering priority targeted HIV prevention projects for high risk populations by increasing the number of NGO projects. Standardised data on production costs and qualitative data on transaction costs were collected and analysed from a sample of these NGO projects in two Indian states. Two data sets are used to explore the impact of increasing coverage on costs: economic cost data from 17 case study interventions; and expenditure data from 82 interventions contracted by one of the state programmes. An econometric cost function examines the influence of coverage on costs. Factors affecting the transaction costs of HIV prevention programmes supporting large numbers of contracts with NGOs are identified from document review and semi-structured interviews. Across the interventions there are variations in coverage, and total and average costs (median cost per person reached is US$ 19.21 (range: US$ 10-51)). Coverage explains over 50% of the variation in total costs. The cost function estimates confirm a non-linear relationship between average cost and coverage. The two states use different contracting models: direct contracting; and contracting a management agency for NGO recruitment, monitoring and evaluation and technical support. The management agency reduces opportunity costs of leakage and poor quality and copes better with large scale contracting than direct contracting. More efficient scaling up could be achieved by increasing the number of interventions delivered by an NGO rather than recruiting new NGOs. Through better understanding costs and transaction costs, the thesis demonstrates that the economies of scale vary with coverage and that governance must adapt with increasing scale of operation.

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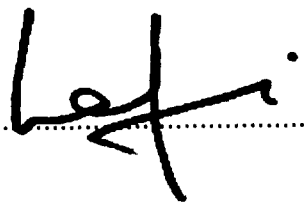
I have read and understood the School's definition of plagiarism and cheating given in the Research Degrees Handbook. I declare that this thesis is my own work, and that I have acknowledged all results and quotations from the published or unpublished work of other people.

Signed:  .....

Date:.....October 5, 2006.....

Full name:...Lorna Guinness.....

List of acronyms

AC	.....	Average cost
AIDS	.....	Acquired Immunodeficiency Syndrome
AP	.....	Andhra Pradesh
APAC	.....	AIDS Prevention and Control Project
APSACS	.....	Andhra Pradesh State AIDS Control Society
BCC	.....	Behaviour Change Communication
BSS	.....	Behavioural Surveillance Survey
CAPACS	.....	Chennai Corporation AIDS Prevention and Control Society
CCOORR	.....	Christian Council for Rural Development and Research
CMIS	.....	Central Management Information System
CSW	.....	Commercial Sex Worker
DFID	.....	Department for International Development, India
EOS	.....	Economies of scale
GOI	.....	Government of India
HHP	.....	Healthy Highways Project
HIV	.....	Human immunodeficiency virus
HLL	.....	Hindu Latex Limited
INR	.....	Indian Rupee
JART	.....	Joint Appraisal Review Team
KI	.....	Key Informant
MACS	.....	Municipal AIDS Control Society
MC	.....	Marginal cost
MSM	.....	Men who have Sex with Men
NACO	.....	National AIDS Control Organisation
NACP	.....	National AIDS Control Programme
NACP2	.....	National AIDS Control Programme (2nd phase)
NGO	.....	Non-Governmental Organisation
PD	.....	Project Director
PLWHA	.....	People living with HIV/AIDS
PSC	.....	Project Steering Committee
RMU	.....	Regional Management Unit (Healthy Highways Project)
RTI	.....	Reproductive Tract Infection
SACS	.....	State AIDS Control Society
SIAAP	.....	South India AIDS Action Programme
SMA	.....	State Management Agency

STI	.....	Sexually Transmitted Infection
TAC	.....	Technical Advisory Committee
TCE	.....	Transaction Cost Economics
TI	.....	Targeted Intervention
TNSACS	.....	Tamil Nadu State AIDS Control Society
TRU	.....	Technical Resource Unit
UNAIDS	.....	Joint United Nations Programme on HIV/AIDS
USAID	.....	United States Agency for International Development
USD	.....	United States Dollar

Chapter 1. Introduction

1.1. Scaling up the response to the global HIV/AIDS epidemic

Close to 40 million people are estimated to be living with HIV/AIDS, with forty-five million new infections expected to occur between 2002 and 2010 (UNAIDS, 2005). Over 60% of these new infections could be averted with a comprehensive prevention package yet the Joint United Nations Programme on HIV/AIDS (UNAIDS) estimates that, in 2005, only one in five people needing basic HIV prevention had access to these services (UNAIDS, 2005). With an estimated 5.7 million people living with HIV/AIDS, India currently bears approximately 15% of the global HIV/AIDS burden and 78% of the HIV prevalence in the region of South and South-East Asia (UNAIDS, 2006). It has the dubious distinction of being the country with, in absolute numbers, the largest HIV epidemic in the world. There is also a large gap in HIV prevention services. Even in the states where prevention services have been well established, the coverage of population groups with high risk behaviours was estimated not to exceed 25% of this high risk population (National AIDS Control Organisation, Voluntary Health Services et al., 2002).

Coverage of a broad range of HIV/AIDS prevention, care and treatment programmes needs to be increased to ensure meeting the United Nations Millennium Development Goals (USAID, UNAIDS et al., 2004; UN Department for Economic and Social Affairs, 2005). UNAIDS has highlighted the urgent need for scaling up prevention programmes (Piot, 2004; UNAIDS, 2004b). Scaling up in this context implies increasing the output of existing HIV prevention services as well as introducing new services in previously uncovered areas. This requires increased resources as well as overcoming demand and supply-side bottlenecks within the existing service delivery systems (Commission on Macroeconomics and Health, 2001). In low income countries, an increasingly important method used to overcome these bottlenecks, increase coverage and increase the efficiency of services has been the contracting out of service delivery to the not-for-profit sector (Liu, Hotchkiss et al., 2004; Loevinsohn and Harding, 2004; Loevinsohn and Harding, 2005). In the case of HIV prevention, as well as addressing the inability of publicly provided services to meet coverage targets, this approach takes advantage of the non-governmental organisations' (NGOs) greater experience and ability to reach marginalised, high-risk populations (Solomon, Chakraborty et al., 2004).

1.2. The economics of scaling up HIV prevention services

Resources required to fill the global gap in services are estimated to be US$ 8.4 billion in 2006 rising to US$ 11.4 billion in 2008 (UNAIDS, 2004b). However, the evidence-base underlying these estimates is far from strong and the nature of costs of HIV/AIDS activities in low-income countries is still poorly understood (Kumaranayake and Watts, 2000c; Kumaranayake and Watts, 2000d; Creese, Floyd et al., 2002; Marseille, Hofmann et al., 2002; Scotland, Van Teijlingen et al., 2003; Walker, 2003; Guinness, Levine et al., 2004). The estimates are based on existing service delivery structures, assume constant average costs across the ranges of coverage analysed and rely on limited data (Attaran and Sachs, 2001; Commission on Macroeconomics and Health, 2001; Schwartlander, Stover et al., 2001; UNAIDS, 2004b). Improved estimates of resource requirements need: a greater understanding of the most appropriate methods to overcome bottlenecks in service delivery; to take into account economic theories of cost and production in which economies or diseconomies of scale can result in variations in the average cost with output; and a broader range of empirical evidence on the costs of HIV prevention services and causes of their variation. Without these foundations, estimates of resource requirements and financing gaps may be subject to large errors.

Economic theory predicts that a number of factors are likely to influence average costs. The relationship between costs and output is driven by the production function. In increasing the scale of production output behaves in different ways according to the production relationship. Depending on the relationship between fixed and variable inputs to production, this can result in economies or diseconomies of scale or constant returns to scale. The nature of the relationship can be identified by comparing the average cost (AC) with the marginal cost (MC) at different levels of output. If MC/AC>1, then there are diseconomies of scale and average costs rise with increases in output; if MC/AC<1, there are economies of scale and average costs are found to fall with increases in output; and, if AC=MC then there are constant returns to scale and the production process is said to be cost-minimising. In addition to the influence of outputs, average costs have been found to be influenced by the production technology applied (the mix of inputs used in service delivery), the scope (e.g. the range of services provided), input prices, levels of efficiency including technical inefficiencies, the context and length of time the service has been provided (Robertson, Castro et al., 1991; Gilson, 1992; Robertson, Hall et al., 1992; Barnum and Kutzin, 1993a; Creese and Parker, 1994; Bitran, 1995; McPake, Kumaranayake et al., 2002; Johns, Baltussen et al., 2003; Hutton, Fox-Rushby et al., 2004; Johns and Tan-Torres, 2005).

The most rigorous way of determining the cost-output relationship is through the application of econometric techniques to estimate a cost function and the marginal costs of service provision (Over, 1986; Barnum and Kutzin, 1993a; Johns and Tan-Torres, 2005). Accounting cost studies that use smaller sample sizes and explore cost profiles to generate hypotheses about the extent and causes of cost variation can also be used to inform on the nature of the cost-output relationship (Barnum and Kutzin, 1993a). However, standardised datasets of production costs and outputs over different coverage ranges and contexts for existing HIV/AIDS interventions that would enable these types of analysis are lacking, leaving a gap in knowledge associated with the causes of variation in the costs of HIV prevention services. Added to this, the impact of different service delivery structures on costs is also unknown.

The literature review for this thesis (see chapter 2) found that there is little evidence on the ability of contracting out to improve coverage and efficiency, with even less information regarding this approach in the field of HIV/AIDS programmes (Marek, Diallo et al., 1999; Palmer, 2000; Barnett, Connor et al., 2001; Slack and Savedoff, 2001; Oliveira-Cruz, Hanson et al., 2003; Liu, Hotchkiss et al., 2004; Peters, Mirchandani et al., 2004; Palmer and Mills, 2005). Loevinsohn and Harding (2004 and 2005) suggest that contracts with larger coverage may be less expensive per capita than those with smaller coverage but this analysis does not include the transaction costs of contracting (the costs of friction in the contracting process) (Loevinsohn and Harding, 2004; Loevinsohn and Harding, 2005). Although key to understanding whether improvements in efficiency have been made, transaction costs and their ability to outweigh potential cost savings and other benefits in service delivery accruing from contracting out are still poorly understood (Broomberg, 1994; Liu, Hotchkiss et al., 2004).

1.3. Aims of the thesis

In order to address the information gap regarding the impact of the level of output on costs, this thesis aims to examine costs of the delivery of HIV prevention services as activities are scaled up in India. The thesis focus is on the supply-side. It examines provider costs, excluding the costs of users of HIV prevention services and the subsequent effect on demand. The thesis' objectives are to:

1. Develop a sampling frame for the costing of HIV prevention projects in Southern India by describing the response to the epidemic and carrying out a census of NGO HIV prevention activities in two states.

2. Describe how costs change with coverage level by calculating the total and average costs of HIV prevention projects targeted at high risk populations for NGO interventions in two states in India

3. Use econometric techniques to:
   - Identify economies of scale of HIV prevention projects targeted at high risk populations for different levels of coverage by estimating marginal costs; and
   - Assess the impact of key factors, other than scale, on total and average costs of HIV prevention

4. Identify and analyse the transaction costs of different governance arrangements for scaling up targeted HIV prevention projects by contracting with NGOs in three Government of India supported programmes in Southern India.

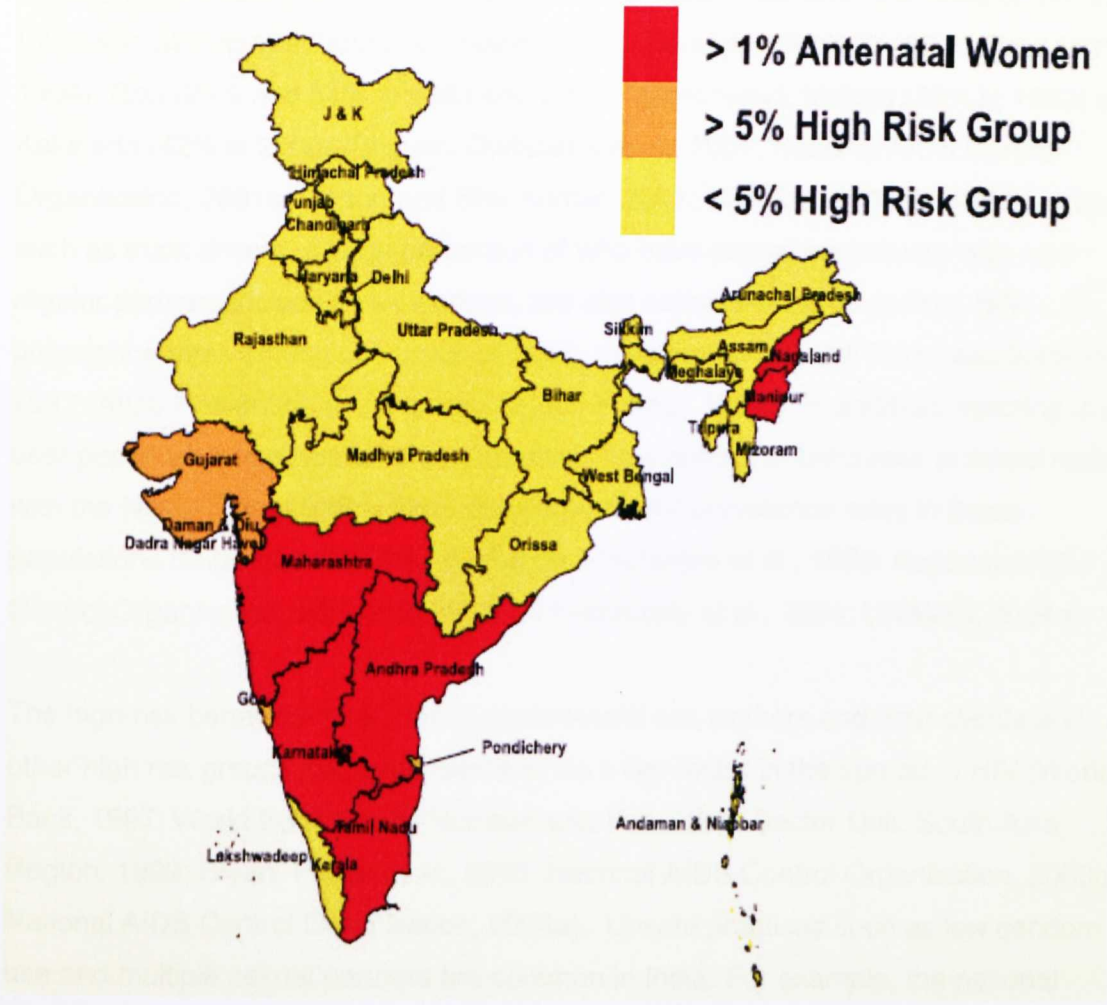
5. Integrate these analyses to identify how scale of activity affects cost and the transaction cost characteristics of specific governance arrangements in order to inform policy debates on expanding HIV prevention services in low income countries.

1.4. Background to HIV/AIDS in India

India is a low-income country with GDP per capita of 2,670 International Dollars and a ranking of 127 in the Human Development Index (UNDP, 2004). Although overall HIV prevalence rates are low (between 0.5 and 1.5% of the adult population (UNAIDS, 2004a)) and there have been reports of the epidemic stabilising (National AIDS Control Organisation and UNAIDS, 2001; Kumar, Jha et al., 2006), the number of people estimated to be living with HIV/AIDS has risen from 3.9 million in 2001 to 5.7 million in 2006 (National AIDS Control Organisation, 2004a; National AIDS Control Organisation, 2005a; UNAIDS, 2006). Due to the expanding number of HIV sentinel sites (increasing from 55 in 1994 to 659 in 2004 (National AIDS Control Organisation, 2004a; National AIDS Control Organisation, 2005a)) and changing methodologies in the calculation of HIV estimates, it is difficult to describe trends in prevalence. The national sentinel surveillance surveys show that the epidemic is concentrated in 6 states – Andhra Pradesh, Karnataka, Maharashtra, Manipur, Nagaland and Tamil Nadu – where HIV prevalence has exceeded 1% in the antenatal population and 5% among high risk

groups[1], as shown in Figure 1.1 (National AIDS Control Organisation, 2001b; National AIDS Control Organisation, 2004a).

Figure 1.1: Map of high, medium and low adult HIV prevalence states in India



Note: For the purposes of HIV sentinel surveillance, high-risk population groups include people attending STD (sexually transmitted disease) clinics, MSM clinics and drug de-addiction centres; HIV prevalence is defined as high if it is greater than 1% in the antenatal population, medium if it is greater than 5% in high risk groups and low if if it is less than 5% in high risk groups.
Source: (National AIDS Control Organisation, 2004a)

With the exception of the North-eastern states (Manipur and Nagaland), the HIV epidemic in India is largely driven by transmission through unsafe heterosexual sex (Pais, 1996; National AIDS Control Organisation, 2000b; National AIDS Control Organisation, 2004a; Solomon, Chakraborty et al., 2004). Sexual transmission is the cause of 87.5% of all infections (National AIDS Control Organisation, 2004a). In 2004, forty percent of infections were estimated to be among women (National AIDS Control

1.

[1] High risk groups are defined as people attending STD clinics, MSM clinics and drug de-addiction centres National AIDS Control Organisation (2004a). Annual Report 2002-2003/ 2003-2004 (up to 31 July 2004). Ministry of Health and Family Welfare, Government of India..

Organisation, 2005a). Increasing incidence of HIV infection in married monogamous women (Gangakhedkar, Bentley et al., 1997; UNAIDS, 2004c) is an indication that the epidemic is moving into the general population. However, HIV infection is still concentrated in the most vulnerable populations, such as sex workers and their clients, injecting drug users and migrant populations (Pais, 1996; Bryan, Fisher et al., 2000; National AIDS Control Organisation, 2001b; UNAIDS, 2001). HIV prevalence rates among sex workers are known to have reached double figures in the cities of Mumbai (60% and 52% in 1997 and 2001 respectively), Madurai (24.2% in 1990), Pune (40% 1994), Goa (29% and 51% in 1993 and 2001, respectively), Vellore (35% in 1993) and Kakinada (42% in 2000) (Bhuyan, Dallabetta et al., 2001; National AIDS Control Organisation, 2001b; Wilson and Shiv Kumar, 2001; UNAIDS, 2004a). Mobile workers such as truck drivers, a large proportion of who have sexual intercourse with non-regular partners including sex workers, are also considered to be at risk. HIV prevalence rates among this group of highly mobile men in Tamil Nadu was 9.4% in 1997 (AIDS Prevention and Control (APAC) Project, 1999). In addition, injecting drug user populations are particularly vulnerable. This pattern of behaviour is linked mainly with the North-East of India where estimates of HIV prevalence rates in these populations range from 5% to 80% (Panda, Chatterjee et al., 1998; National AIDS Control Organisation, 2001b; Solomon, Chakraborty et al., 2004; UNAIDS, 2004a).

The high-risk behaviour practised by commercial sex workers and their clients and other high risk groups has been identified as a key factor in the spread of HIV (World Bank, 1997; World Bank Health Nutrition and Population Sector Unit. South Asia Region, 1999; Bryan, Fisher et al., 2000; National AIDS Control Organisation, 2000b; National AIDS Control Organisation, 2004a). Unsafe practices such as low condom use and multiple sexual partners are common in India. For example, the national behavioural surveillance survey (2001) showed 6.6% of the sample had a non-regular sexual partner in the most recent year and only 32% of these consistently use condoms (National AIDS Control Organisation, 2001b). Another study revealed 87% of 6,000 truck drivers having had sex with a commercial sex worker while only 11% were using condoms during commercial sex (Rao, Pilli et al., 1999). The 2002 behavioural surveillance in Tamil Nadu showed that 27% of truckers and their helpers interviewed had sex with non-regular partners in the previous year, although this is a decrease from 48% in 1996 (AIDS Prevention and Control Project (APAC), 2002; Solomon, Chakraborty et al., 2004). A high prevalence of sexually transmitted infections (STI) also indicates both unsafe sexual practices and increased risk of infection and high rates of HIV infection observed in STI clinic patients bear this out (Thappa, Singh et al., 1999; National AIDS Control Organisation, 2002). In addition, STI prevalence surveys

have found overall STI prevalence rates of 15.8% in the general population in Tamil Nadu (AIDS Prevention and Control (APAC) Project, 1998) and 42.4% among female sex workers in Eastern Andhra Pradesh (Bhuyan, Shobarani et al., 2001)

HIV/AIDS in India adds another burden to a health system already struggling to meet the demands placed upon it (National Commission on Macroeconomics and Health, 2005a). The Indian health system is a complex mix of central, state and local responsibility and public, private and "not for profit" delivery mechanisms. Aside from the centrally organised vertical programmes, decision-making in the public sector takes place at the state level where centrally provided budgets are allocated to health services. Although there is a large network of public health care providers, public spending is at 1% of GDP, putting India in the bottom 20% of countries' public expenditures on health (Peters, 2003). Household expenditure comprises over 70% of all health expenditures, the majority of which are out-of-pocket (National Commission on Macroeconomics and Health, 2005b; Peters, Yazbeck et al. 2002). In spite of efforts over the last 50 years to improve access to free primary care, it is still easier and cheaper for villagers to seek care from the local quack (National Commission on Macroeconomics and Health, 2005b). Over 79% of outpatient care for the poor is in the private sector which is made up of both trained and untrained providers as well as those who practice Indian systems of medicine (Peters, Yazbeck et al. 2002). Since the introduction of the National Health Policy of 1983, an increasingly important part of health system development has been the creation of public-private partnerships and the strengthening of the regulatory framework (Peters, 2003). With the successes of the National Blindness Control and National Leprosy Programmes, there is also a growing recognition of the need to include the not-for-profit sector as an effective means of achieving improved access in an equitable manner and quality services (National Commission on Macroeconomics and Health, 2005c).

With the assistance of the World Bank and a number of other donors, the country has been expanding its National AIDS Control Programme (NACP) by increasing the range and coverage of HIV prevention services. The NACP is a vertical programme located in central government that releases funds to their implementing partners in the states. To facilitate the expansion of activity and to expedite the release of funds, AIDS-specific organisational structures and government arrangements have been established. The vertical HIV/AIDS programme is being decentralised with the establishing of autonomous state AIDS control societies (SACS). These SACS are responsible for implementing HIV prevention and AIDS treatment and care within their states with a budget provided by the NACP. The SACS work with a number of partner

organisations for different activities including medical training colleges for capacity development and public hospitals in the provision of counselling and education at specialised STI clinics.

In the case of outreach activities for higher risk groups an innovative approach has been taken. The SACS contract with local not-for-profit non-governmental organisations (NGOs) to provide best practice HIV prevention projects. The model for these projects is provided by the NACP and is based on experience from all over India. The prevention projects comprise a combination of peer education, promotion of safer sex behaviour, referral for treatment of STDS and provision or sales of condoms. At the outset, the national programme planned to fund 600 NGO projects in this way within the 5-year programme (National AIDS Control Organisation, 2000b).

Budgeting for the NGO HIV prevention projects for high risk groups is based on a restricted set of financial analyses assuming constant average costs for all scales of activity and organisational arrangements (National AIDS Control Organisation and UNAIDS, 2001). The opportunity costs of these projects have yet to be calculated. In practice, the organisational structure and new governance arrangements and the increase in coverage have likely led to changes in the cost structure and non-linear variation in the average costs. In such circumstances, the new organisational structures and different levels of activity imply variations in efficiency. There have been no analyses at the national or international level addressing the implications of this variation in efficiency on the identification of appropriate organisational forms, optimum levels of project coverage or resource requirement estimation.

1.5. Overview of the methods used in the thesis

To ensure a complete analysis of the provider costs of service delivery both production and transaction costs need to be considered. The research undertaken for this thesis therefore includes the collection and analysis of a combination of qualitative and quantitative data on the production and transaction costs of HIV prevention services in India. To gather the information required for the study, the research comprises four major components with the following specific aims:

1. A mapping survey of NGO HIV prevention projects to establish a sampling frame and assess the feasibility of the study.

2. The collection and in-depth analysis of production cost data from a set of case study HIV prevention projects for vulnerable groups delivered by NGOs to

identify and explain the causes of average cost variations with a particular focus on project scale.

3. The econometric modeling of a cost function for HIV prevention services in order to estimate the marginal costs of service delivery, identify the existence of economies of scale at different levels of coverage and assess the impact of other key contextual factors on total and average costs

4. The collection of qualitative data from case study funding agencies and NGO service providers to identify and analyze the transaction costs of different governance arrangements for scaling up HIV prevention services by contracting out to NGOs.

1.6. Structure of the thesis

Chapter 2 lays out the rationale for the analysis based on a review of current knowledge of the costs of scaling up HIV prevention and health services. Based on the literature review a framework for analysis is developed. Chapter 3 then provides a general overview of the methodology followed to study the economics of scaling up HIV prevention interventions in Southern India. This includes the methods followed to carry out a mapping of HIV prevention services in the region under study. Chapter 4 describes the results of the mapping analysis and provides a background for the analysis of transaction and production costs. The subsequent three chapters present the results of the costs of HIV prevention services in Southern India. Each chapter provides a brief background to the analysis in the form of a supplemental literature review, an overview of the data collection methods and the methodological approach, a detailed description of the analytical methods applied and the results of the analyses. Chapters 5 and 6 examine the production costs of scaling up. Chapter 5 uses a set of case studies to explore the total and average costs and cost profiles of HIV prevention services. Chapter 6 estimates a cost function for these services. The last of the results chapters, Chapter 7, analyses the institutional environment and transaction costs of large scale programmes for HIV prevention. Finally, chapter 8 presents the discussion in the form of research and policy implications resulting from the analysis and a summary of the results and conclusions.

Chapter 2. Literature review of the economics of scaling up

2.1. Introduction

As stated in Chapter 1, the aim of the thesis is to examine the provider costs of HIV prevention services as activities are scaled up in India. The thesis uses the tools of the economics of organisation to explore how state governments are scaling up HIV prevention services and the production cost implications of their actions. This chapter introduces the topic with a summary of the current knowledge of the supply side in the economics of scaling up HIV prevention interventions. The chapter starts with an overview of the methods used for the literature review. Next, in order to construct a definition of "scaling up" the review examines interpretations of the term in the international health policy literature. It then goes on to describe the range of HIV prevention services provided in low income countries. Strategies used for scaling up and knowledge regarding their constraints and costs are then identified with, given the nature of the Indian National AIDS Control Programme (NACP), a particular focus on the contracting out of health services to increase service coverage. Subsequently, the literature review explores both theoretical and empirical work on how scale affects costs and considers issues regarding the measurement of both production and transaction costs of health services as well as the measurement of scale. The final section summarises the existing evidence identified in the literature on the economics of scaling up health services and highlights questions that have not been previously addressed.

2.2. Methodology

Relevant literature to the topic of the economics of scaling up in HIV prevention services was identified through examining five key topics:

- International health policy on the scaling up of health and HIV/AIDS services
- Economic theories of contracting with a focus on transaction cost economics
- Theories of cost and production
- Evidence on the governance of HIV prevention services in low income countries
- Evidence on cost-output relationships in HIV prevention and other health services

In searching for literature on these topics, a combination of strategies was followed:

1. Formal citation database searches (including Econlit, Pubmed and ISI Web of Science) of titles and key words/MESH terms combined with manual reviewing of the search results to identify relevant literature.

2. Consultation of key internet sources on economics and management of health services in low and middle income countries (e.g. Partnerships for Health Reform Plus - www.phrplus.org, Institute for Health Sector Development - www.ihsd.org, the World Bank, the Indian National AIDS Control Organisation (NACO) – www.nacoonline.org , UNAIDS – www.unaids.org , the World Health Organisation – www.who.int and the Commission on Macroeconomics and Health - www.cmhealth.org).

3. Consultation with experts in the individual areas covered by the research.

4. Review of the bibliographies in the papers generated from the previous search strategies.

5. Consultation of Economics and Econometrics text books.

2.3. What is scaling up

In 2001 the Commission on Macroeconomics and Health findings highlighted that the major burden of avoidable mortality in developing countries arises from a small number of health conditions. The Commission went on to recommend the "scaling up" of interventions to prevent or treat these priority conditions or that:

"*access to priority health services be dramatically expanded so that they are universally available*" cited in (Hanson, Ranson et al., 2003) p. 3

The provision of universally available health services is further defined by Victora et al.:

"*a policy that builds on one or more interventions with known effectiveness and combines them into a programme delivery strategy designed to reach high, sustained and equitable coverage at adequate levels of quality, in all who need the interventions*" (Victora, Hanson et al., 2004) pg 1541.

The emphasis in these population or system level definitions of scaling up is expanding access of services for all. However, scaling up can take on a number of different dimensions. Uvin describes 4 such perspectives with respect to NGOs: expanding coverage or expanding size; increasing activities; broadening the indirect impact i.e. increase the activities that seek to affect the behaviour of other actors; and enhancing organisational sustainability (Uvin, Jain et al., 2000). Similarly, De Jong examines the question from the perspective of inputs (e.g. expanding organisational size, integrating other activities into the interventions) and outputs (e.g. reaching more people, expanding geographical coverage or increasing service intensity or volume) (De Jong, 2001).

Table 2.1 summarises the different dimensions of scaling up and classifies them according to whether scaling up relates to how services are delivered (input-based) or the service achievements (output-based). These dimensions are closely related. In order to explore the implications of increasing output, the focus of analysis does not pre-empt the importance of the other input focussed dimensions of scaling up. As well as looking at marginal changes in coverage at the service delivery level (output orientation), it is important to understand what is required to achieve this scaling up including any re-organisation on the input side. Where there are large gaps in service coverage, this input side re-organisation can imply significant change in the way service delivery is organised and governed, such as the contracting out of health services as used by the Indian National AIDS Control Programme to ensure coverage of vulnerable groups. Acquiring an understanding of both the organisational changes required to scale up and the marginal changes in coverage within these provides important inputs into project design by helping identify appropriate scaling up technology and avoiding the replication of inefficiencies across service delivery units.

Table 2.1: Various Definitions of Scale

Input-based	*Output-based*
• Expanding organizational size • Increasing the scale of activity engaged in • Increasing the number of service delivery units • Integrating other activities ('horizontally' – addressing unrelated activities; 'vertically' – addressing different levels of related problems) in order to reach more people	• Achieving universal coverage • Reaching more people • Expanding geographic areas reached • Reaching other target groups • Increasing the volume of outputs • Increasing the intensity of impact within a given geographic area/ social group • Increasing the sphere of influence of the organization

* Source: (Kumaranayake, 2000; Uvin, Jain et al., 2000; De Jong, 2001; Hanson, Ranson et al., 2003)

As the report of the Commission on Macroeconomics and Health notes, achieving these ends is dependent on understanding the gap in coverage, the increase in inputs to fill this gap and the best methods with which to achieve these ends i.e. it also requires consideration of how these are combined and delivered (Commission on Macroeconomics and Health, 2001).

In the 2005 progress report on the Millennium Development Goals, no low income region was on track to meet the HIV/AIDS component of Goal 6 to stop and reverse the spread of HIV/AIDS, malaria and other major diseases including tuberculosis (UN Department for Economic and Social Affairs, 2005). Funding gaps have been well documented as a problem faced in scaling up health interventions to achieve internationally set targets (Commission on Macroeconomics and Health, 2001; Schwartlander, Stover et al., 2001; World Health Organisation, 2002a; Global HIV Prevention Working Group, 2003; Hanson, Ranson et al., 2003; Global HIV Prevention Working Group, 2004; UNAIDS, 2004b). Understanding the level of funding required requires context specific cost information (the marginal cost of service delivery), the delivery strategies chosen for scaling up (the technology) and the political environment within which scaling up takes place (Devarajan, Miller et al., 2002; Hanson, Ranson et al., 2003). The following sections therefore explore the service delivery methods and organisational forms used to scale up health services in low income countries and the evidence base regarding the effectiveness and cost of these strategies with a particular focus on expanding HIV/AIDS services for all in need.

2.4. HIV prevention services in low income countries

HIV prevention services include a wide range of activities, largely differentiated by the client-base that they serve. In estimating global resource requirements, UNAIDS uses a list of 15 different interventions that are seen as core components of a national HIV prevention strategy (UNAIDS, 2004b). Table 2.2 provides a description of the different types of interventions that UNAIDS includes in this analysis. Of these, the provision of education and condoms, strengthening treatment services for sexually transmitted infections, prevention of mother-to-child transmission, voluntary counselling and testing, ensuring the safe blood supplies, universal precautions and interventions targeted at specific populations with a high risk of infection are the core activities in any national HIV prevention programme (Kumaranayake and Watts, 2001; UNAIDS, 2004b).

Priority-setting exercises both at the international and national level have shown that the maximum impact on the epidemic will be achieved by different combinations of

these interventions implemented at different stages of an epidemic (World Bank, 1997; Kumaranayake and Watts, 2001). If HIV infected individuals infect more than one other individual HIV prevalence will not only be sustained but increase. As a result the focus of early intervention efforts has been high risk groups *"characterised by a high number and change of partners and with multiple, overlapping or concurrent sexual relationships"* (Kumaranayake and Watts, 2001) p. 458. These targeted interventions not only focus efforts in areas where the highest incidence is generated if left unchecked but have also been found to be one of the most cost-effective approaches to preventing an HIV epidemic, particularly in the early stages (World Bank, 1997; World Bank Health Nutrition and Population Sector Unit, 1999; Kumaranayake and Watts, 2001; Creese, Floyd et al., 2002). As an epidemic spreads to the general population, the targeted interventions require complementary services for broader population groups (Kumaranayake and Watts, 2001).

In spite of increasing availability of resources for AIDS programmes the coverage of HIV prevention programmes is still limited in countries both with early and later stage epidemics (see Table 2.2) (USAID, UNAIDS et al., 2004). Condom programmes are reported to cover only 20% of risky sex acts world wide and only 16% of the priority group of commercial sex workers have been reached by prevention efforts (USAID, UNAIDS et al., 2004). This gap in coverage is mirrored in India where the coverage of population groups with high risk behaviours has been estimated not to exceed 25% of this high risk population (National AIDS Control Organisation, Voluntary Health Services et al., 2002). Coverage of a broad range of HIV/AIDS prevention interventions therefore still needs to be increased to meet the United Nations Millennium Development Goal of halting and reversing the HIV/AIDS epidemic by 2015 (USAID, UNAIDS et al., 2004; UN Department for Economic and Social Affairs, 2005).

Table 2.2: The range and coverage of HIV prevention programmes that form part of a national HIV AIDS programme

Intervention/ activity	*Definition*	*% coverage (all reporting countries), 2003*
Mass media campaigns	Education programmes for the general population implemented through the mass media e.g. TV, radio, posters or newspapers	n/a
Voluntary counselling and testing	HIV testing and provision of both counselling and education for individuals who come forward voluntarily	0.2% of adult population in 2003
Condom social marketing	Sales of subsidised condoms promoted using mainstream advertising and marketing techniques	n/a
Public sector condom promotion and distribution	Free distribution of condoms and promotion to the general and targeted population	21% of risky sexual contacts (defined as all sexual contacts between commercial sex workers and clients, men having sex with men, casual sex contacts and contacts between spouses when at least one partner has outside partners)
School-based AIDS education	Education for children in school	64% of children enrolled in primary and 86% in secondary education
Peer education for out-of-school youth	Education for children out of school carried out by trained members of their peer groups	20% of street children
Targeted prevention programmes • Outreach programmes for sex workers and their clients • Outreach programmes for men who have sex • with men • Harm-reduction programmes for injecting drug users • Prevention programmes for special populations (prisoners, migrants, truck drivers, etc.)	A varying combination of education, condom distribution, counselling and treatment of sexually transmitted infections for specific high-risk populations	16% of commercial sex workers 11% of men who have sex with men 4.3% of injecting drug users 53% of male prisoners
Treatment of sexually transmitted infections	Ensuring access to services for treatment of sexually transmitted infections through strengthening of existing services, provision of additional services and education to increase uptake of these services	n/a
Prevention programmes for people living with HIV	Education targeted specifically at people living with HIV/AIDS	n/a
Workplace prevention programmes	A varying combination of education, condom distribution, counselling and treatment of sexually transmitted infections for people in the workplace	n/a
Prevention of mother-to-child transmission	Minimising the risk of mother to child transmission through provision of ARVs, promotion of appropriate feeding (exclusive breast or bottle feeding) and delivery through caesarean section.	8% of pregnant women offered services

Table 2.2 (cont): The range and coverage of HIV prevention programmes that form part of a national HIV AIDS programme

Intervention/ activity	*Definition*	*% coverage (all reporting countries), 2003*
Post-exposure prophylaxis	Provision of ARVs to individuals exposed to the virus	n/a
Safe medical injections	Ensuring clean needles and syringes when injecting	n/a
Universal precautions	Ensuring clean medical equipment and use of protective clothing in medical facilities	n/a
Blood safety	Screening of blood to ensure blood supplies are free of HIV	n/a

Adapted from: (UNAIDS, 2004b) and (USAID, UNAIDS et al., 2004); n/a – not available

2.5. Strategies and constraints in scaling up HIV/AIDS services in low income countries

Aside from the analysis of the Working Group 5 of the Commission on Macroeconomics and Health the literature on strategies for scaling up of health services is limited. The Commission recognised that scaling up could only be achieved by overcoming bottlenecks in the system and the methods selected for scaling up should depend on the nature of existing constraints (Commission on Macroeconomics and Health, 2001). These can occur at different levels: at the community/ household level; the health service delivery level; the health sector policy and strategic management level; across other public sectors; and at the level of the institutional environment or country context. These types of constraint apply equally to HIV prevention programmes. However, HIV/AIDS programmes face additional problems. Firstly, the relatively new phenomenon of HIV and AIDS require "scaling up" prevention, care and treatment activities from a baseline of no output. Second, prevention activities can be provided through a broad array of channels from the workplace to the health clinic to the mass media, increasing the importance and difficulty of coordination. And, third, the stigma associated with the disease creates barriers both to the uptake of services and to the sensitisation of health service professionals (see Table 2.3).

Table 2.3: Constraints to scaling up and methods used to overcome those constraints

Level	*Constraint*	*Additional problems faced by HIV prevention programmes*	*Interventions identified for overcoming constraints*	*Interventions frequently used in HIV prevention in low income countries*
Community and household level	Lack of demand & physical/ financial/ social barriers to use	Stigma associated with seeking HIV/ STI-related services New disease requiring education to create need for services	Community participation Bamako Initiative programmes Community health worker training Appropriate patient use of drugs through education programmes Social marketing programmes	Targeted and mass media education programmes encouraging risk and health seeking behaviour change Training peer educators & community health workers Social marketing programmes
Services delivery level	Shortage and distribution of qualified staff Weak technical guidance, management & supervision Inadequate drugs and supplies Lack of equipment & infrastructure	New disease/ epidemic requiring sensitisation and training Drugs for prevention of mother-to-child transmission only recently available at affordable prices	Human resource development - training and quality assurance Service organisation – quality assurance & service reorganisation Encouraging delivery by private (for profit and not-for-profit) providers Improvement of drug supplies – charging user fees for drugs, education to improve prescribing practices & drug retailer training	Sensitisation and training of public and private providers Improvement of supply chain Recruitment of human resources Working with not-for-profit providers Negotiating lower drug and rapid test prices
Sector policy and strategic management level	Weak and over-centralized planning and management Weak incentives to use inputs efficiently Weak drug policies and supply system Inadequate regulation Lack of inter-sectoral action and partnership for health b/w govt and civil society Reliance on donor funding	Until recently in many countries, issue not prioritised and left to uncoordinated efforts by NGOs	Management strengthening Introduction of management information systems, disease surveillance systems and quality assurance systems Contracting out Drug policy and supply systems reform Coordination and regulation of private and pharmaceutical sector	Contracting out
Cross sectoral public policies	Government bureaucracy Poor availability of communication and transport infrastructure		Not reported	Working with the education sector to increase school enrolments Working with businesses

Table 2.3 (cont): Constraints to scaling up and methods used to overcome those constraints

Level	*Constraint*	*Additional problems faced by HIV prevention programmes*	*Interventions identified for overcoming constraints*	*Interventions frequently used in HIV prevention in low income countries*
Environment and contextual factors	Governance and overall policy corruption, weak government, weak rule of law • political instability/ insecurity • low priority attached to social sectors • weak structures for public accountability lack of free press Physical environment • disposition to disease • impact on accessibility of services		Not reported	Working on regulation to prevent exploitation and trafficking of women and provide IDUs with clean injecting equipment

Adapted from: (Oliveira-Cruz, Hanson et al., 2003; UNAIDS, 2004b).

Oliveira-Cruz et al.. (2003) review the various methods applied to overcoming health system constraints and these are also summarised in Table 2.3. They note that these are generally not well documented and that it is difficult to draw conclusions about successes and failures (Oliveira-Cruz, Hanson et al., 2003). Corresponding investments in HIV programming are also listed in Table 2.3 and equally, there is very little evidence to support the success of the approaches used in terms of increasing access and utilisation of services. Social marketing has been shown to have an important impact on the uptake of contraceptive services over time (Eloundou-Enyegue, Meekers et al., 2005; Terris-Prestholt, Kumaranayake et al., 2005b). Research trials in East Africa have also shown how strengthening STI services can increase their uptake, albeit in the context of a trial where patient recruitment is a primary goal of the activity (Kinsman J, 2002). Barnett et al. document the important role of contracting out service provision to NGOs and Civil Service Organisations to fill service coverage gaps (Barnett, Connor et al., 2001). Indeed, as in the historical development of sexual health services, NGOs have played a critical role in developing the market for HIV prevention services throughout the developing world (Ambegaokar and Lush, 2004; UNAIDS, 2004b).

NGOs have been addressing the gap in HIV prevention service coverage from the start of the HIV crisis (Solomon, Chakraborty et al., 2004). As funding has become available to low income countries, governments have recognised this role and have increasingly involved civil society and NGOs in the delivery of HIV/AIDS programmes through contracting out these services to these non-state providers. In South Asia and Brazil, government contracts with NGOs have been a core component of the National AIDS programmes (World Bank Health Nutrition and Population Sector Unit. South Asia Region, 1999; World Bank Health Nutrition and Population Sector Unit. South Asia Region, 2000; Barnett, Connor et al., 2001; World Bank Health Nutrition and Population Sector Unit. South Asia Region, 2003). Little is known about how successful these and other government-NGO partnerships have been in expanding HIV/AIDS services. Only in Brazil have the factors affecting the success of contracting been documented (Barnett, Connor et al., 2001). Given the important role of NGOs in the delivery of health services, the use of NGO-government partnerships to address HIV prevention service gaps and the lack of evidence on the effectiveness of these partnerships in increasing service coverage, the next section draws on the literature of contracting out in more general health service expansion in order to identify key problems that these partnerships might face and factors that facilitate success.

2.6. Contracting out to increase service coverage

Contracts are explicit or implicit exchange relationships between agents. Contracting out by the public sector implies that rather than deliver services directly, the government purchases those services from an alternate provider on behalf of the population. One of the key rationales for introducing contracting out of health services in low income countries has been to increase coverage, in particular for vulnerable or hard to reach populations (Nieves, La Forgia et al., 2000; Slack and Savedoff, 2001; Vladescu and Radulescu, 2002; Harding and Preker, 2003; Liu, Hotchkiss et al., 2004; Loevinsohn and Harding, 2004; Peters, Mirchandani et al., 2004; Loevinsohn and Harding, 2005). Largely driven by donor funding and their programmes, contracting out is reputed to be able to also address the problems of quality, equity and efficiency inherent in many public services in low income countries (Liu, Hotchkiss et al., 2004). Evidence suggests that it has also been introduced to tackle issues of accountability, coordination, civil service employee regulations and lack of political will (Barnett, Connor et al., 2001).

In theory, contracting out helps overcome public service delivery bottlenecks through increasing allocative efficiency so that services are produced at minimum cost and resources allocated to maximise quality and ensure a distribution in line with social value (McPake, Kumaranayake et al., 2002). Two major schools of economic thought drive this hypothesis. First, property rights theory suggests that the main source of inefficiency in the public sector is the weakening of property rights (Milgrom and Roberts, 1992; Hart, 1995). The private sector (including the not for profit sector) therefore faces greater incentives to use resources efficiently and to deliver services productively. Second, public choice theory states that politicians and bureaucrats are likely to act in their own interests or those of powerful interest groups rather than in the public interest (Frant, 1996). Contracting out is hypothesised to address this with the use of objective evaluation tools that enable more systematic performance based monitoring and encourage a more productive use of resources that falls closer in line with public interest (Liu, Hotchkiss et al., 2004).

In assessing the success of contracting out in achieving these potential efficiency gains, conventional forms of economic analysis can provide us with insights into the costs and efficiency of HIV prevention services by using the cost function to examine how inputs are related to outputs and prices. This neoclassical model assumes that transactions are costless (Gravelle and Rees, 1981). However, the nature of organisation through the governance of contracts also affects the cost of service delivery. By further examining the costs of friction in the transaction, transaction cost

economics explores the impact on governance arrangements, in the form of organisational structures and strategies (Williamson, 1983). Although a departure from the neoclassical analysis of costs and efficiency, transaction cost economics uses the same analytical perspective of the utility maximising objectives of parties to a transaction. The resultant framework predicts that institutional factors alongside behavioural and service characteristics including scale of activity, lead to different organisational forms in an attempt to minimise transaction costs.

For contracting with the private sector to succeed in increasing coverage at lower cost than direct public provision a number of conditions are required: enough potential providers to create competition; adequate capacity to enter into and manage the contractual relationships; provider competition to enhance efficiency; and benefits outweighing the transaction costs (Broomberg, 1994; Palmer, 2000; Harding and Preker, 2003). These conditions are not necessarily in place. Many low income countries have poorly developed markets for health service provision characterised by lack of competition (Mills, 1998; Palmer, 2000; Oliveira-Cruz, Hanson et al., 2003). The problems of limited government capacity for contracting in low income countries have also been highlighted (Bennett and Mills, 1998; Mills, 1998; Oliveira-Cruz, Hanson et al., 2003; Peters, Mirchandani et al., 2004). Evidence from developed countries suggests that increasing competition is unlikely to achieve great efficiency (Broomberg, 1994). It is also hypothesised that high transaction costs are a major obstacle to scaling up health services efficiently when contracting with the private sector, further reducing any likely gains in efficiency (Broomberg, 1994; Oliveira-Cruz, Hanson et al., 2003; Liu, Hotchkiss et al., 2004).

In practice little is known regarding the ability of contracting to address the constraints of access, quality, equity and efficiency (Marek, Diallo et al., 1999; Palmer, 2000; Slack and Savedoff, 2001; Oliveira-Cruz, Hanson et al., 2003; Liu, Hotchkiss et al., 2004; Peters, Mirchandani et al., 2004; Palmer and Mills, 2005). Evaluations of contracting out initiatives in Cambodia, Bangladesh and Central America have shown some positive results in terms of improved quality, equity, efficiency and transparency (Abramson, 2000; Abramson, 2001; Bhushan, Keller et al., 2002; Jack, 2003; Soeters and Griffiths, 2003). There is also evidence to indicate that contracting out has been successful in filling service gaps through increased coverage (Nieves, La Forgia et al., 2000; Slack and Savedoff, 2001; Chowdhury, 2002; Soeters and Griffiths, 2003; Loevinsohn and Harding, 2004; Loevinsohn and Harding, 2005). Whether these gains can be sustained in the long term is not known (Liu, Hotchkiss et al., 2004). To demonstrate improvements in efficiency as services are expanded, the analysis of

costs is required. By comparing different contracting studies Loevinsohn et al. (2004 and 2005) suggest that contracts with larger coverage may be less expensive per capita than those with smaller coverage (Loevinsohn and Harding, 2004; Loevinsohn and Harding, 2005). However, the evidence on these gains in efficiency is not strong. The literature review for this thesis identified only two studies comparing costs of contracting out with direct public service delivery in developing countries, that attempted to measure the full costs of contracting including transaction costs (Mills, Hongoro et al., 1997; Loevinsohn and Harding, 2004) (see Section 2.7.2.2 below)).

Cost analysis provides insights into efficiency and can therefore help ensure the most productive use of resources in the process of scaling up. An understanding of both production costs and transaction costs is required to assess gains or losses in efficiency associated with a particular strategy. Although key to understanding whether improvements in efficiency have been achieved, the role of transaction costs and their potential to outweigh benefits accruing from contracting out are still poorly understood, in particular in low income countries (Broomberg, 1994; Liu, Hotchkiss et al., 2004). Indeed, there is still a significant research gap pertaining to both the production and transaction costs of scaling up health services through contracting out. If existing evidence on costs is based on inefficient programmes, resource requirement estimates merely reflect the replication of inefficiencies in a system. In addition, it is important to know how costs change as output is increased and at what level of output costs are minimised. In light of this gap in knowledge, the following section draws on the economic theories and existing evidence on production and transaction costs to identify their predictions for the efficiency of scaling up HIV prevention services through NGO contracting. For both the production and transaction aspects of costs, the review first examines the general theory, followed by applied research in health services and HIV/AIDS. Next, it focuses on relevant research in the area of HIV/AIDS in India where the evidence permits. Each sub-section then explores the methods used to measure the respective costs. Finally, methods for measuring scale in the context of HIV prevention services are reviewed.

2.7. The costs of scaling up

2.7.1. Production costs of scaling up HIV/AIDS interventions

2.7.1.1. Economic theory of production, costs and scale

Production

The standard short run production function serves as the starting point for understanding the cost structure of the HIV prevention interventions and the relationship between costs and scale. A production function describes the relationship between the inputs and outputs of the production processes and identifies the level of output that can be produced for a given set of inputs. The short run is defined as the period over which only variable inputs, those that are dependent of the level of production, increase or decrease and there is fixity of capital i.e. there are fixed inputs "that are held constant and independent of the level of production" (Gold, Siegel et al., 1996).

The mathematical representation of this relationship is presented as follows:

$Q = f(X_1, X_2 ..... X_n)$, where Q is the output of any production process and X_i (for i = 1, 2 ... n) represents the quantities of n different inputs.

The production function is described as the locus of technically efficient points of production i.e. the minimum level of inputs required to achieve different levels of output. In increasing the scale of production (raising output by increasing the inputs to production), output behaves in different ways according to the production relationship. Classically, theory assumes that there are diminishing returns to the variable factor. If increasing a single input leads to the same proportional change in output, this would be defined as constant returns to the variable factor and where output increases at a greater than proportional change to the increase in the input, there are increasing returns to the variable factor.

Scaling up production (increasing outputs) in the long run allows for all inputs to production (fixed and variable) to be scaled up. If all inputs are increased by the same constant factor, the most natural outcome is constant returns to scale (Varian, 1987), where output increases at the same rate as inputs:

$Tf(X_1, X_2) = f(TX_1, TX_2)$ where T is a constant factor and X_i (for i = 1, 2 ... n) represents the quantities of n different inputs.

Scaling up can also lead to increasing and/or decreasing returns to scale. Similarly, there exist the phenomena of returns to scope and short run product-specific returns to the variable factor. In the long run, returns to scope imply that it is technically more efficient to produce selected outputs together than to produce them in different production units. The short-run product-specific returns to the variable factor describe the effect on output of the ith product of increasing inputs while all other outputs remain constant (Barnum and Kutzin, 1993a).

By exploring the relationship between inputs and outputs in production we can explore how marginal product changes at different levels of output and the impact of increasing/decreasing one input on all other inputs while keeping output constant. The most technically efficient provider and the most technically efficient scale of production can be identified by comparing marginal productivities of the different providers.

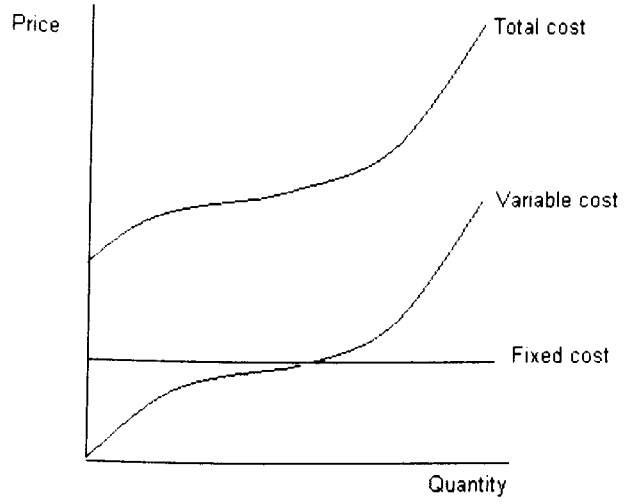
Costs

The cost function has a dual relationship with the production function. This implies that, with constant prices, the production technology can be derived entirely from the cost function and vice versa. The cost function traces the locus of economically efficient points (where economic efficiency is measured as the ratio of costs to outputs). It describes the relationship between outputs and total costs in the production of a good or service and is defined as the minimum cost of producing a given output with given factor prices, so that:

$C = f(Q, W_1, W_2)$ where *C* is total cost, Q is level of output and W_i is input price for input i (for i = 1, 2 ... n)

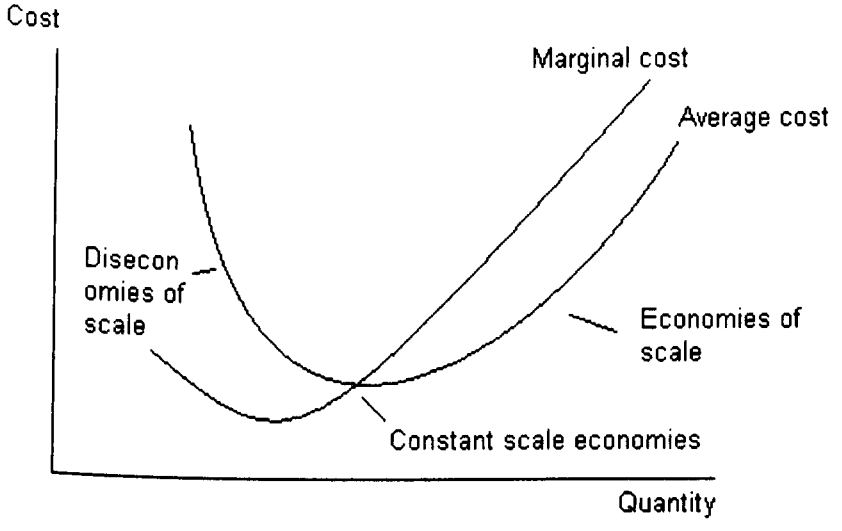
The total cost function is described in Figure 2.1 as the combination of the total variable cost and total fixed cost, where fixed and variable retain the same definitions as in the analysis of production. The straight horizontal line of the total fixed cost curve reflects the fixity of capital in the short run. The slope of the total cost curve is known as the marginal cost (MC) i.e. the change in cost associated with increasing or decreasing output by one unit. The total cost of production associated with each unit is known as the average cost, defined as C/Q. The average cost curve is derived by plotting the slope of the rays from the origin to the total cost curve.

Figure 2.1: The total cost function



Taking a long run perspective, there is an important relationship between the average and marginal cost that allows us to identify if average costs are falling or rising at different levels output (see Figure 2.2). The cost curve is said to exhibit economies of scale if MC/AC<1. This implies that AC is falling with increased output. Conversely, the cost curve is said to exhibit diseconomies of scale if MC/AC>1. Where the long run average cost curve remains constant, MC/AC=1, and we observe constant economies of scale. This concept mirrors the long run production characteristics of returns to scale and should occur at the corresponding levels of output, assuming cost minimisation.

Figure 2.2: The relationship between the marginal and average cost curves



In the short run average and marginal cost curves must be constructed separately for fixed and variable costs as each varies differently with output (Over, 1986). Short run variable returns to the factor and product specific returns to the factor can also be translated into cost theory by exploring the impact on cost of changes in production technology or outputs, respectively.

In summary, the cost function describes the relationship between total costs and output and, where production is technically efficient, can be derived from the production function. Through the derivation of the marginal and average costs at different levels of output, the cost function can also describe whether there are economies or diseconomies of scale. To identify economies of scale and their nature, it is therefore important to understand the relationship between inputs, their prices and outputs as well as the cost structure of a production process i.e. the relative contribution of fixed and variable inputs.

2.7.1.2. Analysing the cost-scale relationship

In an analysis of the relationship between cost and scale, the economist is concerned with efficiency: what is the efficient output level at which production should take place and how might efficiency change as the changes in output(s) occur. The types of questions that might be addressed in analysing the cost-scale relationship for scaling up health services are shown in Table 2.4 along with the types of analyses that are required to explore these questions. The methods used in these analyses depend on the data available and the research question to be addressed (Johns and Tan-Torres, 2005). Accounting cost studies that explore cost profiles and make informed assumptions about or model how the costs of different inputs change with output level can be used to examine the impact of scaling up on total and average costs (Barnum and Kutzin, 1993a; Johns and Tan-Torres, 2005). The best and most rigorous way of assessing the cost-scale relationship, however, is time-series econometrics analysis (Over, 1986; Barnum and Kutzin, 1993a; Johns and Tan-Torres, 2005). Econometric cost function estimation can also be applied to cross-sectional data to explore factors that influence average costs at different coverage levels (Kumaranayake and Watts, 2000d; Johns and Tan-Torres, 2005). Data limitations, particularly in low income settings, do not always allow these latter types of statistical analysis and therefore they have not been frequently applied (Barnum and Kutzin, 1993a; Johns and Tan-Torres, 2005).

Table 2.4: Questions addressed by the theoretical cost-scale relationship and corresponding analyses

Questions	*Data analyses*
How do costs vary with scale of production?	Fixed versus variable costs at different levels of coverage; Average and incremental/ marginal costs at different levels of coverage
What is the efficient scale of production?	Average and incremental/ marginal costs
What are the resource requirements at the scaled up levels of production cost projections?	Marginal and/or incremental costs
What other factors influence total, fixed and variable costs and are important in the cost-scale relationship?	Cost profiles (input & activity); average costs; for different geographical locations, levels of infrastructure, human resource capacity, level of fixed costs, extent of management to cope with scaling up*

*Source (Johns and Tan-Torres, 2005)

The following sections examine accounting and econometric methods used in exploring the impact of scale on the costs of production in health services, then more specifically HIV prevention services in low income countries and HIV prevention services in India in more detail.

2.7.1.3. Accounting cost studies and the costs of scaling up

Accounting cost studies calculate total and average costs to determine performance and estimations of relative efficiency, to compare cost-effectiveness ratios, or to calculate the level of provider reimbursements (Creese, Sriyabbaya et al., 1982; Barnum and Kutzin, 1993a). In spite of their limitations in terms of ability to capture variations in, for example, quality of services, accounting cost studies can analyse performance by comparing average or unit costs and cost profiles across a sample of similar health services providers.

Methodological approaches to an accounting cost study

To assess the accounting costs, it is standard practice to use an ingredients approach in which all inputs to production are identified and a price attached to each of these inputs (Gold, Siegel et al., 1996; Drummond, Stoddart et al., 1997; UNAIDS, 2000a). Which inputs are included in the cost analysis will depend on the research question being addressed. Choices around which costs to include generally take the forms of: total or incremental; financial or economic; societal, provider or patient (Drummond, Stoddart et al., 1997; Kumaranayake, Pepperall et al., 2000). Choices also surround the indicator of output of services. Again this depends on the research question. To define output it is imperative to consider the objective of the service provided (Drummond, Stoddart et al., 1997) and the production process itself. This might

include multiple outputs, in which case all aspects of the scope of production should be included in output measurement to avoid underestimation of the outputs of the programme (Mansley, Dunet et al., 2002). In addition, the respective sizes of the production units/ firms and any correlated variables should be measured in order to control for their influence on average costs and efficiency (Long, Ament et al., 1985). Whereas cost-effectiveness evaluations attempt to capture the impact of the health service intervention by using measures of health outcomes, studies assessing technical or scale efficiency typically use measures of the volume of services provided e.g. number of patients treated or number of condoms distributed (Kumaranayake and Watts, 2000a; De Jong, 2001). The choice of indicator will depend on the question being addressed. In particular, definitions of scale might include the number of HIV infections averted, the number of people accessing prevention services or the number of HIV prevention education sessions held.

Empirical evidence

The effect of scale and scope on costs is best explored using statistical cost analyses and the estimation of marginal cost. However, a few studies have used an accounting approach, some supplemented with simple regression analysis or modelling, on the premise that a better understanding of the cost structure, most notably the degree to which costs are fixed, can provide insights as to how costs might change with scale.

Table 2.5 lists the costing studies identified that use accounting approaches and have explicitly looked at the issue of how average costs change with output in health services in low income countries. The studies use a combination of primary data, interviews with experts and logic to examine this question. By measuring average costs over different ranges of coverage they are able to suggest whether economies of scale exist. However, without measuring the marginal cost they are unable to measure economies of scale. The interventions covered by these studies include primary health care, immunisation programmes, maternal and child health and family planning, nutrition and HIV prevention. In all cases, the studies have found falling average costs, suggesting that in these settings, there is room to expand coverage with the existing set of resources (Creese, Sriyabbaya et al., 1982; Robertson, Davis et al., 1984; Over, 1986; Berman, Brotowasisto et al., 1989; Robertson, Hall et al., 1992; Broomberg and Rees, 1993a; Soucat, Levy-Bruhl et al., 1997; Jian, Jing-Jin et al., 1998; Ensor, Ali et al., 2003; Johns and Baltussen, 2004; Routh, Thwin et al., 2004; Terris-Prestholt, Kumaranayake et al., 2005a). In their review of immunisation costs, Brenzel and Claquin (1994) support this view, concluding that scale, measured as the number of

fully immunised children, is the single most important factor in influencing costs and cost-effectiveness of immunisation programmes (Brenzel and Claquin, 1994).

Variations in average costs across sites are not only attributable to scale. The variation can be caused by a range of factors which need to be accounted for in any analysis of cost variation. These factors include production technology (the mix of inputs used for service delivery), scope (or range of activities), input prices, inefficiencies, the geographical location and the timeframe of analysis.

Production technology: Even for similar health services, the production technology can vary (Barnum and Kutzin, 1993a; Grieve, Dundas et al., 2001; Johns, Baltussen et al., 2003). Some of the factors that might contribute to this are staff mix, such as the ratio of doctors to nurse or more expensive to less expensive staff, referral mechanisms, policy on length of hospital stay and training intensity (Gilson, 1992; Barnum and Kutzin, 1993a; Grieve, Dundas et al., 2001; Johns, Baltussen et al., 2003; Hutton, Fox-Rushby et al., 2004).

Scope: Accounting cost studies have in general not examined the issue of economies of scope. Only three studies were identified that analysed this issue specifically. When routine immunisation services were complemented by mass campaigns in Ecuador the cost per fully immunised child increased, indicating diseconomies of scope associated with adding on a new activity (Shepard, Robertson et al., 1989). Conversely, two studies have found average costs lower in those primary health care facilities with a wider range of services, interpreting that this is as a result of economies of scope (Soucat, 1995) cited in (Soucat, Levy-Bruhl et al., 1997) and (Robertson, Castro et al., 1991).

Table 2.5: Accounting cost studies that examine economies of scale

Study	*Services*	*Output measure*	*Cost data*	*Method*	*Relationship between average cost and output*
(Berman, Brotowasisto et al., 1989)	Rural health services, Indonesia	Outpatient/ immunization contact	Total provider costs; Cross-section of 41 subdistricts	Regression line	Average costs falling with increasing output
(Broomberg and Rees, 1993b)	Primary health care, South Africa	Consultations	Total provider costs; 1 community health centre.	Qualitative identification of excess capacity implying that costs can be reduced by increasing output	Average costs falling with increasing output
(Creese, Sriyabbaya et al., 1982)	Expanded Programme on Immunisation, Indonesia, Philippines & Thailand	Fully immunised child	Provider costs; cross-section from 6 Indonesian, 9 Philipinne and 8 Thai health centres.	Plot of average cost against output	Average costs falling with increasing output holds in spite of differences between organisation factor prices and coverage across sites and countries.
(Dandona, Sisodia et al., 2005b)	Voluntary Counselling and Testing, India	Client receiving full sequence of services	Provider costs; cross section from 17 voluntary counselling and testing centres	Univariate regression of unit cost against output	Average costs falling with increasing output
(Ensor, Ali et al., 2003)	Essential Services Package, Bangladesh	Patients treated	Provider costs (in practice & as planned); cross-section of 20 sub-district health facilities	Plot of average cost against output	Average costs falling with increasing output
(Gilson, 1992)	Primary health care, Tanzania	Health facility contact by activity	Provider costs from 40 district dispensaries in 4 districts	Plot of average cost against output	Average costs falling with increasing output for immunisation and ANC services; no clear relationship between average cost and utilisation for curative care.
(Jian, Jing-Jin et al., 1998)	Polio immunisation days	Immunisations	Provider costs; cross-section from 10 provinces	Simple regression of average cost against output	Average costs falling with increasing output

Table 2.5 (cont): Accounting cost studies that examine economies of scale

Study	*Services*	*Output measure*	*Cost data*	*Method*	*Relationship between average cost and output*
(Johns, Baltussen et al., 2003)	Programme costs of health interventions (i.e. costs incurred at a level other than the delivery point of the intervention)	Person covered	Provider costs obtained from regional experts and logic/ best guesstimates	Costing model incorporating how different categories of cost vary differently with increases in coverage	Average costs falling with increasing output for categories that are fixed (eg TV broadcasts); Average costs increase with increasing output for transport and training due to higher prices and increased quantities respectively Variations across regions and interventions
(Johns and Baltussen, 2004)	(1) Education of CHWs in nutrition and hygiene; (2) Iron supplementation; and (3) iron fortification	Population covered	Modelled provider costs based on regional experts estimations; data presented for one American and one African WHO sub-region: AfrD and AmrA only*	Costing model accounting only for spatial factors in scaling up interventions (i.e. transport, fixed and supervision costs)	(1) Minimum efficient scale at 45% and 30% for AfrD and AmrA, respectively*; (2) Average costs falling with increasing output up to 95% coverage; (3) Average costs increase with increasing output
(Over, 1986)	Primary health care, Niger	Functioning village health teams	Provider investment cost and provider recurrent cost.	Costing model based on different relationships that investment and recurrent costs have with coverage. Logical derivation of minimum efficient scale using qualitative data.	Minimum efficient scale with 1000 function village health teams (i.e. output level prior to scaling up) i.e. rising average costs with output increases

Table 2.5 (cont): Accounting cost studies that examine economies of scale

Study	*Services*	*Output measure*	*Cost data*	*Method*	*Relationship between average cost and output*
(Robertson, Davis et al., 1984; Robertson, Hall et al., 1992)	Expanded Programme on Immunisation, Gambia	(1) Fully immunised child/ no. of vaccinations (2) No. of vaccinations	(1) Provider costs; cross-section across 13 field sites (2) Provider costs; 20 field sites	(1) Plot of average cost against output (2) Plot of average cost against output	(1) Average costs falling with increasing output (2) Average costs falling with increasing output; Smaller sites (health centres vs. hospitals) have higher average costs Average cost falls over time
(Routh, Thwin et al., 2004)	Maternal and child health and family planning, Bangladesh	No. of services	Provider recurrent costs; cross-section of 6 NGO programme sites	Simulation of change in unit cost associated with increases in service volume; identifies excess capacity in human resources (idle time).	Average costs falling with increasing output
(Soucat, Levy-Bruhl et al., 1997)	Primary health care, Benin and Guinea	Population served by a health centre; % children fully vaccinated; % women with 3 prenatal visits; % of new curative care patients	Provider costs for 4 and 5 years and 200 and 214 health centres in Guinea and Benin, respectively	Plot of average cost against target population size; plot of coverage rate for EPI, ANC and curative care against respective average cost over time.	Potential economies of scale in health centre. Benin: coverage increases over time with average costs falling with increasing output in EPI and ANC; no coverage increase in curative care. Guinea: coverage increases over time with average costs falling with increasing output in EPI and ANC; increase in curative care cost due to drug price rises.

Table 2.5 (cont): Accounting cost studies that examine economies of scale

Study	*Services*	*Output measure*	*Cost data*	*Method*	*Relationship between average cost and output*
(Terris-Prestholt, Kumaranayake et al., 2005a)	HIV prevention (IEC, STI treatment, CSM and VCT), Tanzania	No. of IEC activities held attendances at IEC activities; STI syndromes treated; CSM condoms distributed; people collecting their HIV-test results.	Annual provider costs by intervention over time (1996-1999)	Plot of average cost against output over time	Output increases over time for all interventions, except IEC. Falling average cost for STI, VCT and CSM interventions.
(YRG CARE, Horizons Program et al., 2004)	Care and support for people living with HIV/AIDS	No. of patients	Annual provider costs		High fixed costs of operation and excess capacity imply average costs falling with increasing output

* Within the 6 WHO geographical regions country have been classified according to mortality strata: A. Very low child, very low adult; B. Low child, low adult; C. Low child, high adult; D. High child, high adult; E. High child, very high adult (World Health Organisation, 2002b).

Input prices: The prices of resources differ across health service sites and will also have an impact on economic efficiency (Bitran, 1995). Grieve et al. (2001) noted a fifteen fold difference between the highest (Portugal) and lowest (Latvia) cost per hour of European mid grade doctors (Grieve, Dundas et al., 2001), even after adjusting for purchasing power. Variation in input prices may arise for a number of reasons including regional price differences, for example differences between urban and rural areas, and the ability to bulk purchase and bargain prices down.

Technical inefficiencies: Where practice and input prices are similar, it is also possible to find cost variations as a result of inefficiency or different levels of productivity (Gilson, 1992; Barnum and Kutzin, 1993a; Creese and Parker, 1994; Fiedler and Day, 1997; Hutton, Fox-Rushby et al., 2004). Causes of inefficiencies include staff productivity, prescribing practices, wastage and inappropriate technology. Likewise, the objectives of the organisation should be analysed. It might not be the objective of the provider to be efficient or cost-minimising. Mansley (2002) highlights that this issue is likely to be a feature in public health interventions: *"the function we estimated was an observational rather than a minimum average cost function.....* [the assumption of cost minimization] *may not hold for public health programmes that have no competitive incentive to minimise cost"* (Mansley, Dunet et al., 2002). One example is the intention to maintain some level of excess capacity or inbuilt technical inefficiency in order to meet peaks or anomalous increases in demand and ensure accessibility to services (Gold, Siegel et al., 1996).

Context: Geographical location will influence the nature, size of the target or patient population and epidemiology of disease will also affect the average costs (McPake, Kumaranayake et al., 2002; Johns, Baltussen et al., 2003). It will also have a bearing on the existing infrastructure from which a programme can be expanded (Johns and Tan-Torres, 2005). Finally, due to differences in topography, some locations will have higher transportation costs than others (Jian, Jing-Jin et al., 1998; Johns and Tan-Torres, 2005).

Timeframe: A further consideration in understanding cost variation is the length of time a health service has been operating. Four studies identified found average costs falling over time (Robertson, Hall et al., 1992; Soucat, Levy-Bruhl et al., 1997; Stallworthy and Meekers, 1998; Terris-Prestholt, Kumaranayake et al., 2005a). This increase in efficiency can be attributed to learning and programme maturity (Over, 1986; Stallworthy and Meekers, 1998). On the other hand, increased uptake of services and

economies of scale may be responsible (Robertson, Hall et al., 1992; Soucat, Levy-Bruhl et al., 1997; Terris-Prestholt, Kumaranayake et al., 2005a).

Accounting cost studies of HIV/AIDS programmes

Only three of the studies identified in Table 2.5 analyse HIV/AIDS programmes. Each of these suggests potential economies of scale when increasing service delivery output. These are rare examples of accounting cost studies in HIV/AIDS programmes. Reviews of the economic costs and cost-effectiveness of HIV/AIDS programmes have consistently identified lack of information as well as insufficient detail and transparency in the ways in which cost analyses have been presented, with a tendency to focus on the overall cost and cost-effectiveness ratio (Kumaranayake and Watts, 2000c; Creese, Floyd et al., 2002; Scotland, Van Teijlingen et al., 2003; Walker, 2003).

The evidence on the costs of HIV prevention in India is further limited. A review of the published and grey literature found only 4 cost analyses based on empirical data collection (see Table 2.6) and one cost-effectiveness analysis using a modelling approach and cost data from the international literature (Gonzales, Grosskurth et al., 1999; Wilson, 1999; World Bank Health Nutrition and Population Sector Unit. South Asia Region, 1999; National AIDS Control Organisation and UNAIDS, 2001; Dandona, Sisodia et al., 2005b). Only one of these explored the issue of how costs change with scale of activity (Dandona, Sisodia et al., 2005b).

Table 2.6: Costs of HIV prevention in India: summary of the evidence.

Author	*Method*	*Unit cost (USD)*
(Dandona, Sisodia et al., 2005b)	Economic cost analysis of voluntary counselling and testing in Andhra Pradesh	Cost per client receiving full services (USD) – 2.92 – 17.14
(Wilson, 1999)	Final evaluation of truckers' projects in North (N) and South (S) India.	Unit costs (USD): per BCC*** activity – 6.68 (S) /3.63 (N) per Condom distributed –0.16(S)/ 0.12(N) per STI referred–14.51(S)/ 4.67(N) per STI treated – 18.75 (S)/ 37.15 (N) Variations between & within regions.
(Gonzales, Grosskurth et al., 1999)	Economic cost analysis of Sonagachi sex worker intervention from provider perspective	Unit costs (USD): Per year - 268,720 Per member of target population - 24.01 Per STI** treated - 10.62 Per BCC*** contact -0.64, Per condom distributed - 0.22
(National AIDS Control Organisation and UNAIDS, 2001)	Development of budgetary guidelines using financial analysis of interventions for sex workers, migrants, transport workers and street children	Financial cost per person per year (USD): Sex workers/IDU^/MSM^^ – 28 Migrants – 6 Transport workers – 2.2 Street children – 15.8

*United States Dollar
**Sexually Transmitted Infection
***Behaviour Change Communication
^Department for International Development
^^National AIDS Control Organisation
^Injecting Drug User
^^Men who have Sex with Men

The need for a greater transparency in HIV prevention costings to permit the interpretation of costs, the assessment of technical and economic efficiency and the consideration of how costs change with programme replication or expansion is evident. The World Health Organisation and UNAIDS have made some inroads into improving the understanding of resource requirement estimation for both prevention and treatment using methods summarised in Table 2.5 (Adam, Evans et al., 2003; Johns, Baltussen et al., 2003; Gutierrez, Johns et al., 2004). However, in the absence of improved evidence, resource requirement estimates at the international level continue to use cost data with minimal understanding of programme efficiency and assume constant average costs (World Bank and UNAIDS, 2000; Commission on Macroeconomics and Health, 2001; Schwartlander, Stover et al., 2001; Opuni, Bertozzi et al., 2002; UNAIDS, 2004b).

2.7.1.4. Econometric estimation of the cost function

Econometric methods estimate cost functions using multivariate analysis to explain how costs vary with level of output. In relating total costs to different output variables, the regression parameters are used to estimate the average and marginal cost, so describing how costs vary with scale of activity (Berndt, 1990). This is the only technique that enables the direct estimation of marginal costs. Ideally resource estimation should be based on a cost function estimated using these techniques (Over, 1986; Barnum and Kutzin, 1993b; Johns and Tan-Torres, 2005). The advantages of

this econometric approach are: changes in marginal cost in response to input prices and quantities are considered; the model can incorporate multiple outputs facilitating the exploration of economies of scope; and the impact of contextual factors can be tested with the use of exogenous explanatory variables (Barnum and Kutzin, 1993b).

Constructing cost functions in health services

The literature on the estimation of cost functions in health services has concentrated on hospital costs and comprises two main approaches to estimating cost functions: those that are *ad hoc*; and those that build on the theory of the firm (Vita, 1990; Scott and Parkin, 1995; Li and Rosenman, 2001; Smet, 2002; Adam, Evans et al., 2003). *Ad hoc* cost functions tend to use an additive linear specification to explain variations in the cost per unit of output and include all variables for which a relationship to cost is hypothesised (Vita, 1990; Scott and Parkin, 1995; Smet, 2002). However, the coefficients in such a regression do not have obvious economic interpretations (Breyer, 1987). In addition, as average cost is used as the dependent variable there is a problem associated with including output on both sides of the equation which can lead to an exaggeration of the extent and importance of economies of scale (Goldman and Grossman, 1983; Barnum and Kutzin, 1993b). The alternative "*production theoretic*" methods are constructed using specifications based on knowledge of the production units and neoclassical cost theory (Vita, 1990).

Identifying a clear model of provider behaviour to relate cost to output has been problematic for those studies requiring theoretical consistency. Using the neoclassical profit maximisation model of the firm to explain incentives is unlikely to reflect the true behaviour of health care providers ruled by such factors as the Hippocratic oath or maximising health gain. Instead a number of different behavioural objectives have been modelled in the literature including maximising output, minimising costs, maximising a combination of profit and output, maximising prestige and even satisficing models of behaviour (Barnum and Kutzin, 1993b). Cowing et al. (1983) conclude that the neoclassical cost function in which costs are minimised is the most useful theoretical framework for analysing hospital costs. This is both a more general assumption than profit maximisation and consistent with a variety of institutional and behavioural features of the hospital sector and health services as a whole (Cowing, Holtman et al., 1983; Vitaliano, 1987).

A standard cost function based on economic theory takes the following form (see, for example (Scott and Parkin, 1995)):

$C = f(Q,W)$, where C is the total cost of production, Q is output, and W are input prices.

Cost functions based on the economic theory of production and costs use the duality property of cost and production. The function must therefore meet the regularity conditions: C is non-negative, real valued, non-decreasing, positive for non-zero Q and linearly homogenous in input prices (Caves, Christensen et al., 1980). To determine economies of scale requires the estimation of a long run cost function. However, for cross-sectional data the assumption of a long run cost function is unrealistic (Cowing, Holtman et al., 1983; Scott and Parkin, 1995). A preferred approach in this instance is to assume cost-minimisation with respect to the variable inputs such that:

$C^v = C(Q,W^v,K)$, where C^v is total variable cost, W^v the price of variable inputs, and K are fixed inputs.

The relationship between short and long run cost functions can also be derived if information is available on the price of capital inputs (Scott and Parkin, 1995). Estimates of "economies of scale" in the absence of such information can only predict what will happen to *variable* costs when outputs are increased for a *given organisation size* (Barnum and Kutzin, 1993b; Scott and Parkin, 1995; Smet, 2002). Smet's (2002) review of hospital cost functions finds that most studies estimate short run variable cost functions and an emerging consensus that few hospitals are operating in long run equilibrium (Smet, 2002). The short run cost function assumes that facilities are operating at technically efficient points in the production possibility set. This is unrealistic and particularly the case for health facilities in low income countries (Barnum and Kutzin, 1993b; Mansley, Dunet et al., 2002). Allowances for those non-technically efficient observations can be made using an index of efficiency based on the production function, similar to the approach used by Wouters in her analysis of health facility costs in Nigeria (Wouters, 1993).

A major strength of econometric estimation is that it allows for the inclusion of multiple outputs in the cost function (Cowing, Holtman et al., 1983; Breyer, 1987; Barnum and Kutzin, 1993b). Therefore there is no limiting restriction of a single measure of scale but output can be measured by using a set of indicators that reflect different aspects of scale of activity or volume of services (Kumaranayake and Watts, 2000b). Wouters takes advantage of this to estimate a bi-product cost function (Wouters, 1993). The hospital cost literature uses this property to explore the impact of case mix on costs (Cowing, Holtman et al., 1983; Breyer, 1987; Barnum and Kutzin, 1993b; Scott and

Parkin, 1995). However, by using measures of output rather than outcome (e.g. number of patient days rather than number of inpatients with successful treatment) there are problems in controlling for quality. This can be overcome in the *ad hoc* approach by using some measure of quality as an output or independent variable in the model if data are available. Another drawback to econometric estimation and the multi-product cost function is the requirement of large standardised datasets (Barnum and Kutzin, 1993b). Without such datasets it is difficult to obtain statistically significant results. This has resulted in their limited use, particularly in low-income countries.

In the estimation of hospital cost functions based on economic theory, a variety of functional forms have been used. Although able to provide a useful test for constant returns to scale, functions taking the form of the Cobb-Douglas and Constant Elasticity of Substitution constrain the elasticities of substitution between inputs to a constant value and, in the former case, unity (Berndt, 1990). More flexible functional forms, notably the translog, have therefore become more popular in exploring issues of economies of scale and scope (Cowing, Holtman et al., 1983; Goldman and Grossman, 1983; Vita, 1990; Scott and Parkin, 1995; Li and Rosenman, 2001). These are able to represent any arbitrary structure of production, lifting the constraint of constant elasticities of substitution between inputs and allowing for second- and third-order terms on outputs as well as the interaction of output terms (Grannemann, Brown et al., 1986; Vita, 1990; Scott and Parkin, 1995). Although the preferred model in hospital cost analysis, there are limitations to its application. The increased flexibility is gained at a cost of an increased number of parameters to be estimated (Caves, Christensen et al., 1980; Vita, 1990). As a result, this reduces the number of explanatory variables that can be used in the model to ensure significant results and therefore is of particular concern where sample sizes are small (Breyer, 1987; Scott and Parkin, 1995). However, of the three possible flexible functional forms (the generalized Leontief, the quadratic and the translog), the translog is "*the most parsimonious in parameters*" (Caves, Christensen et al., 1980).

In the case of the multi-product hospital with its diverse technologies, these structural cost models can still be considered naïve (Grannemann, Brown et al., 1986). For this reason, Grannemann et al. (1986) developed a "hybrid" functional form that maintains the theoretical consistency of linear homogeneity in factor prices but includes other explanatory variables that might have a causal relationship with costs (Grannemann, Brown et al., 1986; Vita, 1990; Smet, 2002; Weaver and Deolalikar, 2004). In this way, the model is able to derive valid estimates of marginal costs (Grannemann, Brown et

al., 1986). The advantages and disadvantages of the different functional forms used for estimating cost functions are summarised in Table 2.7.

Table 2.7: Advantages and disadvantages of different functional forms for the estimation of a cost function in health services*

	Functional form	*Advantages*	*Disadvantages*
	Ad hoc	Permits inclusion of any variable likely to influence total and average costs including quality	No theoretical basis; concern with including output on both sides of the equation
	Cobb-Douglas	Provides simple test for economies of scale; Satisfies conditions for duality of cost and production	Elasticity of substitution between inputs constrained to unity
	CES	Satisfies conditions for duality of cost and production	Constrained to constant elasticity of substitution between inputs
Fkexibe functional forms	Generalised Leontieff	Linearly homogenous in input prices	Constrained to constant elasticity of substitution between inputs; Generalizing to permit flexibility in scale economies requires large no. of parameters.
	Quadratic		Not linearly homogenous in input prices
	Translog	Linearly homogenous in input prices	Does not allow zero output values due to log specification
	Generalised Translog	Linearly homogenous in input prices; uses Box-Cox transformation to allow for non-zero outputs	
	Hybrid	Linearly homogenous in input prices; incorporates other causal variables than output quantities and input prices	Does not allow zero output values due to log specification; The other explanatory variables only explain deviations from predicted cost not changes in the cost-output relationship

*Sources: (Caves, Christensen et al., 1980; Berndt, 1990; Smet, 2002)

Two further important issues to address in estimating a cost function are whether the assumption that outputs are not endogenous is met and the method in which input prices enter into the model (Smet, 2002). If the producer of services can choose the level of output the regression coefficients will be biased (Smet, 2002). In the case of hospital services characterised by third party payment, the relationship between prices and quantity demanded is weak and therefore output decisions are unlikely to be dominated by cost of production (Grannemann, Brown et al., 1986; Smet, 2002). This issue needs to be explored for the specific service and institutional set up under analysis. Where outputs are found to be endogenous, unbiased estimates of the regression coefficients can be obtained by constructing and estimating a system of equations (Smet, 2002).

Due to difficulties in obtaining reliable data or to limit the parameters being estimated, input prices are sometimes not interacted with output levels or even excluded from the

cost function estimation (Smet, 2002). In the case of the former, this implies that prices do not affect the relationship between total cost and output, but rather act as cost-shifters (Grannemann, Brown et al., 1986; Smet, 2002). If input prices are excluded, this implies that there are no input substitution possibilities or the assumption that prices are equal across all observations (Cowing, Holtman et al., 1983; Aletras, 1997; Smet, 2002). However, where one input price is constant across the production units, this price can be treated as the implicit price numeraire and excluded from the regression. In this case, because of the homogeneity condition, all input price parameters are then still identified in the model (Cowing, Holtman et al., 1983; Smet, 2002).

Estimation of marginal costs and economies of scale using the cost function approach

The cost function can be used to calculate average and marginal cost and identify returns to the variable factor and returns to scale. Table 2.8 summarises the calculations required to predict these measures of interest as reported by Barnum and Kutzin (1993) (Barnum and Kutzin, 1993b).

Table 2.8: Measures of economic efficiency based on the cost function

Measure	*Equation*	*Definition*
Marginal Cost (MC)	$MC_i = \delta C / \delta Q_i$	The marginal cost of producing an additional unit of output i.
Average Incremental Cost (AIC)	$AIC_i = [C - C(Q_{n-1})] / Q_i$	The average added cost of producing the ith output (Q_i) as compared with producing all outputs except Q_i.
Short run returns to the variable factor (SPRVF)	$SRVF = C / \sum MC_i Q_i$	Index showing the effect on costs of a general increase in output when scale and output mix remain fixed. *If SRVF > 1, the level of output is below optimum efficiency; if SRVF < 1, the level of output is above optimum efficiency*
Short run product specific returns to the variable factor ($SPRVF_i$)	$SPRVF_i = AIC_i / MC_i$	Index showing effect on costs of a proportional increase in all inputs on the output of the ith product (all other outputs fixed) *SPRVF >1 → product-specific returns to variable factor exist*
Economies of scope (SCOPE)	$SCOPE = \frac{[C(Q_s) + C(Q_{n-s}) - C(Q)}{C(Q)}$	Index showing whether it is cheaper to produce selected outputs jointly rather than separately *If SCOPE > 0, economies of scope exist*
Economies of scale (EOS)	$EOS = (1 - \sigma_{C,k}) / \sum \sigma_{C,Q_i}$, where σ_{ab} indicates elasticity of a with respect to b; and k is capital stock	Index showing the effect on costs of a general increase in output when the output mix remains unchanged and all inputs are allowed to vary. *If EOS>1, economies of scale exist; if EOS<1 diseconomies of scale exist*

Note: n = number of observations; i refers to the ith output where outputs are the same; s refers to the sth output where outputs are different (in the context of economies of scope).

Source: (Barnum and Kutzin, 1993a)

Empirical evidence

Econometric applications in the estimation of cost functions for health care services have been well described in terms of how they look at issues of efficiency, scale and scope in both high and low income country settings e.g.(Cowing, Holtman et al., 1983; Barnum and Kutzin, 1993a; Aletras, 1997; Weaver and Deolalikar, 2004). Barnum and Kutzin (1993) review the existing econometric hospital cost function studies for low income countries at the time of their study (Barnum and Kutzin, 1993b). They find that the five studies identified follow the chronological technical development of hospital functions in developed countries, moving from *ad hoc* analyses of hospital costs in Kenya (Anderson, 1980) to the *production theoretic* estimation with flexible function forms for hospitals in Ethiopia, Colombia and China (Bitran-Dicowsky and Dunlop, 1989; Barnum and Kutzin, 1993b). More recently, Weaver et al used a generalised translog cost function for hospitals in Vietnam and found that economies of scale and scope depend on the category of hospital as well as output (Weaver and Deolalikar, 2004). Due to the limited availability of large standardised datasets, studies from low income countries are limited in number. This lack of studies, combined with the application of different methods across them, makes it difficult to make generalisations from the results (Barnum and Kutzin, 1993b). Similarly, yet in spite of a large number of studies, results from hospital cost functions for developed countries are inconclusive regarding economies of scale and scope (Cowing, Holtman et al., 1983; Barnum and Kutzin, 1993b; Aletras, 1997; Smet, 2002).

Few econometric studies of health service costs exist outside the hospital cost arena. These include community and home health care services, blood collection costs and cancer detection in the US (Jacobs and Rawson, 1978; Goldman and Grossman, 1983; Kass, 1987; Mansley, Dunet et al., 2002), cochlear implantation costs in UK (Barton, Bloor et al., 2004) and health care services in Nigeria (Wouters, 1993). Of these studies only Wouters (1993) and Kass (1987) use production theoretic approaches to estimating economies of scale (Kass, 1987; Wouters, 1993). Both Wouters (1993) and Goldman and Grossman (1983) also estimate production functions to assess returns to the variable factor and returns to scale (Goldman and Grossman, 1983; Wouters, 1993). Not surprisingly, as a result of the mix of services and methods, the results regarding economies of scale are mixed. The average cost functions for cochlear implants and cancer detection programmes find economies of scale (Mansley, Dunet et al., 2002; Barton, Bloor et al., 2004). The home health studies indicate limited economies of scale in both cases (Goldman and Grossman, 1983; Kass, 1987). Wouters (1993) finds increasing returns to scale with respect to admissions, nearly

constant returns to scale for outpatient visits, and the ray specific economies of scale show constant returns to scale (Wouters, 1993). Finally, the average cost function for donor recruitment and blood donation services indicates diseconomies of scale associated with increased recruitment (Jacobs and Rawson, 1978).

In the area of HIV, econometric estimation has been exploited to look at the impact of scale on costs using data from a range of intervention types across countries in sub-Saharan Africa (Kumaranayake and Watts, 2000d) and across different continents (Marseille, Dandona et al., 2004) and in voluntary counselling and testing services (Kumaranayake, 2004; Dandona, Sisodia et al., 2005b) as well as the impact of advertising on the cost of national level condom promotion programmes over time (Terris-Prestholt, Kumaranayake et al., 2005b). More recently Dandona et al. have published a study examining the costs of HIV prevention programmes of female sex workers in Andhra Pradesh (Dandona, Sisodia et al., 2005a). This study finds 88% of the variability in total economic cost explained by the number of behaviour change communication contacts, condoms distributed, contacts related to STIs and contacts related to enhancing the enabling environment (Dandona, Sisodia et al., 2005a). However, the still limited range of studies means that there is no clear understanding of the shape of the cost function and marginal costs of individual HIV prevention intervention types.

2.7.1.5. Empirical methods applied in measuring costs

The most commonly used technique for measuring costs of public health interventions in developing countries is the accounting approach. In valuing costs of implementation, standardised methods are used for identifying inputs into production and valuing these inputs (Creese and Parker, 1994; Gold, Siegel et al., 1996; Drummond, Stoddart et al., 1997; UNAIDS, 2000a). It is normal practice to estimate the economic cost by identifying all the inputs, calculating the net present value of capital investments and valuing all inputs using current market prices converted to constant currency. In this way both financial and economic costs of a particular service can be calculated. The former captures actual expenditures, whereas an economic analysis considers the opportunity cost of implementation.

Cost analyses using the accounting cost approach not only ignore the possibility of changing unit costs with increased level of output but also do not differentiate between the short and long run. Where the impact of economies of scale is being analysed this distinction has important repercussions in the interpretation of results. Using a classification system that distinguishes between fixed and variable costs enables the

identification of those factors that remain fixed in the short term (UNAIDS, 2000a). Supplementing cost data collection with background information about the history of the project and what investments would be required to expand current levels of activity can help in determining how costs are likely to change over short and long run timeframes (eg (Robertson, Davis et al., 1984; Over, 1986)). Furthermore, this can help identify key major influences on costs such as budgetary guidelines, funding gaps, geographical location of the project and socio-economic and cultural characteristics of the target population.

2.7.2. Transaction costs in scaling up HIV/AIDS interventions

2.7.2.1. Transaction cost economics – the theory

Formally, transaction costs are defined as the costs of friction in the process of exchange (Williamson, 1983). The nature of the transaction costs will influence how the production of the good or service is organised and governed. Transaction costs and the resulting forms of organisation are a function of certain properties underlying the transaction(s) and the institutional environment[2] in which production or service provision takes place (Milgrom and Roberts, 1992; Shelanski and Klein, 1995). Different organisational structures are established to minimise the transaction costs (Williamson, 1983). Where transactions are costless we would expect to see governance by the market and discrete spot contracts (as assumed in the neoclassical model).

Transaction costs are shaped by the presence or not and interaction of bounded rationality, opportunism and asset specificity (see Table 2.9). Bounded rationality refers to the ability of individuals to obtain and process all the information, in this case, to comprehend all the eventualities that might arise from the transaction and is exacerbated under situations of uncertainty (Williamson, 1987). Opportunism is defined as behaviour of parties to act in their own self interest at the expense of others or lying and cheating (Williamson, 1987). The presence of bounded rationality can thus permit or even facilitate opportunistic behaviour.

1. _____

[2] The *institutional environment* is the broader set of institutions within which people and organisations develop and implement *institutional arrangements*.

Table 2.9: The governance implications of the interaction between transaction cost generating behavioural characteristics and asset specificity^

Behavioural Assumption		Asset specificity	Governance implications
Bounded rationality	*Opportunism*		
×	✓	✓	Comprehensive contracting
✓	×	✓	Relational contracting
✓	✓	×	Spot contracts
✓	✓	✓	Bureaucracy

^ Adapted from (Williamson, 1987). × = not present; ✓ = present

The role of asset specificity is key (Williamson, 1983; Hart, 1995; Flood, 2000). If one party to the transaction is required to make an investment specific to the transaction of concern, it may find itself in a "hold up" situation, whereby it incurs considerable losses if the transaction fails (Milgrom and Roberts, 1992). As a result, as the cost of transactions rises, incentives to remove the transactions from the market are created. Eliminating a difference in interests by merging two contracting parties may be the most effective way to prevent the risk of rent expropriation associated with asset specific investments (Shelanski and Klein, 1995; Hart, 1996; Flood, 2000). With this move towards the internal organisation of transactions or hierarchical governance, the role of the price mechanism in resource allocation is reduced and the organisation itself becomes the locus of control (Coase, 1937; Alchian and Demsetz, 1972). At the extreme the centralisation of organisation results in bureaucracy.

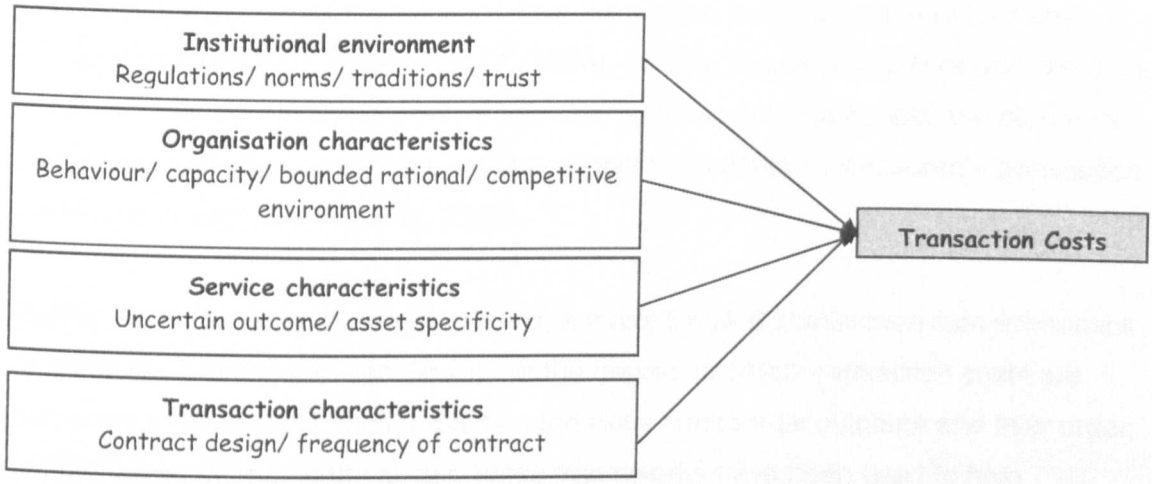
In addition to the three basic tenets above, frequency of the transaction and the institutional environment serve to further influence the transaction costs (Williamson, 1983; Williamson, 1996; Ashton, 1998; Palmer, 2000; Allen, 2002). Transactions that recur frequently are associated with higher transaction costs as the number of transactions is necessarily higher. This can lead to the creation of specialised procedures to avoid recurrent transaction costs (Milgrom and Roberts, 1992). The institutional environment can be defined as a combination of the degree to which competition is present (Williamson, 1983; Palmer and Mills, 2000), the nature of the regulatory framework (Williamson, 2000) as well as the presence of cultural norms, codes and conventions (North, 1990) that shape behaviour. Trust[3] is also key to

1.

[3] Various definitions to trust exist from an individual's expectation of a desirable action being performed by the trustee to the assessment of goodwill in a transaction with uncertain outcome (Nielsen, 2001).

limiting the degree to which transaction costs can escalate (McMaster and Sawkins, 1996). The factors influencing transaction costs are summarised in Figure 2.3.

Figure 2.3: Factors influencing the nature of transaction costs



2.7.2.2. Application of the transaction cost economics framework in the public sector

Transaction cost economics and New Institutional Economics, the sub-discipline in which it sits, have focussed for the most part on the organisation of industry and firms but increasingly insights from this work are being absorbed into the public sector in an exploration of economic development and reform processes (Ashton, 1998) (Grindle and Hilderbrand, 1995; Frant, 1996; Ashton, 1998; Goddard and Mannion, 1998; Isham and Kahkonen, 1999; Jan, 2000; Mills, Bennett et al., 2000; Palmer, 2000; Palmer and Mills, 2000; Allen, 2002; Azfar, 2002). Few transaction cost economics evaluations of public sector services have attempted to measure transaction costs. This is because the transaction cost minimising institutional arrangement takes into account the *ex ante* costs of negotiating, establishing and safeguarding a contractual arrangement. As a result some transaction costs are non-explicit or not realised rendering it impossible to capture their full extent in quantifiable form (Masten, Meehan et al., 1991).

Where transaction costs have been quantified, a narrow definition has been used, for example: the costs of negotiating, monitoring and enforcing a contractual agreement; or the price of the contract over and above the production costs of a particular service (Mills, Hongoro et al., 1997; Loevinsohn and Harding, 2004). The limited research in this area suggests that even these quantifiable transaction costs represent a significant share of overall costs in health services. Empirical evidence has shown that transaction costs were 30% of premium revenue in the regulated insurance market in Chile and about one third of total cost savings envisaged by the Hospital Rate Setting Commission of New Jersey (Hsiao, 1995; Liss, 1995) cited in (Kumaranayake, 1998).

Mills et al. (1997) found that the cost of contracts for hospital service provision was between 20 and 25% higher than the costs of direct provision with any cost-savings accruing to the provider rather than purchaser of services (Mills, Hongoro et al., 1997). Similarly, Posnett et al.'s (1998) evaluation of the total purchasing pilot projects in the UK found that per capita transaction costs were equal to the per capita direct costs of management (Posnett, Goodwin et al., 1998). Finally, in comparing contracting models of service delivery the direct government service delivery in Cambodia, the difference in per capita provider costs appear to be largely attributable to measurable transaction costs (Loevinsohn and Harding, 2004).

Rather than measuring transaction costs, a major focus of transaction cost economics analysis has been in the identification of the degree to which transaction costs are perceived to be present, their impact on the likely contractual outcome and their order of magnitude. In the health sector, these frameworks have been used to help understand how costs and cost structures change as a result of health sector reform e.g. (Ashton, 1998; Palmer and Mills, 2000; Allen, 2002) and the use of economic analysis in health sector decision-making (Jan, 2000).

Allen uses this framework to analyse the introduction of contracts in the NHS and shows how it would have been identified *a priori* that comprehensive contracting was not feasible due to asymmetries of information, a lack of trust between payers and providers and the asset specificity of resources associated with health service delivery (Allen, 2002). A better prior understanding of the transactions might have led to improved and more appropriate contracting or governance arrangements. A similar analysis in New Zealand shows that transaction costs are not homogenous across all health services but vary according to the type of service provided (Ashton, 1998). The implication is that the methods used for governing transactions should also vary across these services i.e. one size does not fit all. Finally, Palmer (2003) documents how regional governments' dependence on private primary care providers in areas of poor health care is a form of asset specificity that has led to relational contracting in South Africa in spite of incomplete contracts and evidence of opportunism (Palmer and Mills, 2003).

The few qualitative studies that have examined the transaction costs in-depth thus show that the predictions of transaction cost economics are largely correct. Bounded rationality, asset specificity and scope for opportunism in health services imply serious contractual difficulties. As a result comprehensive contracts are deemed inappropriate

(Allen, 2002), relational contracts have evolved (Palmer and Mills, 2000; Palmer and Mills, 2003) and the extent of these difficulties varies across services (Ashton, 1998).

2.7.2.3. The transaction costs of scaling up

Scaling up adds another dimension to the understanding of contracting out for health services. Qualitative work on health service contracting has largely concentrated on how managed market reforms have impacted on efficiency of service delivery and the implications for governance rather than how different levels of coverage may impact on transaction costs (Ashton, 1998; Allen, 2002; Palmer and Mills, 2003). As stated above, contracts with the private sector have been used successfully to scale up health services (Nieves, La Forgia et al., 2000; Slack and Savedoff, 2001; Chowdhury, 2002; Soeters and Griffiths, 2003; Loevinsohn and Harding, 2004; Loevinsohn and Harding, 2005) and it is suggested that there are likely to be economies of scale with higher levels of coverage within a single contract (Loevinsohn and Harding, 2004). Although, none of the existing presentations of transaction cost economics address this directly, theoretically, the prediction of decreasing average costs over increasing output is consistent with transaction cost economics. However, contracting with a single provider is more likely to lead to reduced competition and a "hold-up" situation with the purchaser or provider at risk of losing asset specific investments (Milgrom and Roberts, 1992). In addition, due to geographical, socio-economic or cultural conditions, a contract with a single provider may not be sufficient to cover the entire population targeted. As scale increases, more contracts are likely to be required, requiring more inputs at all stages of the contracting process. With these greater numbers monitoring can also become more complex, exacerbating problems of bounded rationality and opportunistic behaviour. There is no evidence available in the health services or international development literature that assesses the transaction cost implications of scaling up services.

2.7.2.4. Empirical methods used in measuring transaction costs

In examining transaction costs, empirical techniques have included both quantitative and qualitative analysis. Mills et al identified transaction costs as the price of the contract plus the costs of negotiating and managing the agreement minus the direct costs of services (Mills, Hongoro et al., 1997) and used detailed cost analysis along with a review of the contractual process and agreement to identify these costs. In an evaluation of the total purchasing pilot projects in the NHS transaction costs were estimated as the value of resources devoted to undertaking the additional functions related to total purchasing (Posnett, Goodwin et al., 1998). Analyses such as these fail

to capture the complete problem of transaction costs which take into account the *ex ante* costs of contracting that might not be realised if one organisational form evolves as opposed to another. As a result of this, transaction costs are not necessarily quantifiable and therefore transaction cost economics research has concentrated on the collection of qualitative information through case studies (Masten, Meehan et al., 1991). Although questionnaire surveys help explain some phenomena, an in-depth understanding is better achieved through interviews of parties to the contracting process (Azfar, 2002). Semi-structured interviews, focus group discussions and surveys of documents based on case studies are the most frequently used methods for assessing transaction costs in health services (Ashton, 1998; Palmer and Mills, 2000; Allen, 2002; Palmer and Mills, 2003). These types of qualitative methods are standard techniques used to explain phenomena that are difficult to quantify (Britten, 1995). They are particularly useful techniques for building the body of knowledge in this field. By providing in-depth insight, they can test the realisation of theory in practice and can lead to the generation of hypotheses for further study (Coast, 1999; Mays and Pope, 2000; Thorne, 2000).

Studies using these qualitative approaches have identified the transaction costs in contractual relationships and attempted to explain their presence using the transaction costs characteristics as described by Williamson (Williamson, 1983). The costs of negotiating, establishing, safeguarding and enforcing the contracts are identified through a process of document review and semi-structured interviews to pinpoint the actions taken towards each of these ends. Explaining the influence of the institutional environment and the nature of the transacting parties is also important in explaining the transaction cost problem. This requires an understanding of the role of key stakeholders, the historical background, the regulatory framework, cultural norms and how these might shape the contracts with NGOs for the delivery of HIV prevention services and the implementation of services themselves (Ashton, 1998; Williamson, 2000; Allen, 2002). Of particular importance is the ability of each contracting party to rely on the regulatory framework to enforce the contractual agreement. A combination of document review and interviews with stakeholders can be used to acquire this information (Ashton, 1998; Allen, 2002).

2.7.3. Measuring scale

In measuring scale the choice of indicator depends on the nature of the research question (Drummond, Stoddart et al., 1997) and should be comparable across the units of analysis. Typically these can be categorised into three different groups for indicators – impact, outcome and output (Grassly, Garnett et al., 2002; Marseille, Dandona et al.,

2004). Where the research question is looking at efficiency, the most appropriate indicators are impact and outcome indicators that capture some aspect of quality and the degree to which a service is reaching its goal. Outcome indicators enable comparison across services with different activities but similar goals e.g. different methods for reducing risky behaviours. Impact indicators refer to the final goal of a service e.g. HIV infections averted and can be used to make comparisons across the range of HIV prevention services. For research looking at service delivery scale, using an output based perspective, the indicator needs to capture the different activities involved and the intensity of their implementation. Depending on the service and the unit of analysis, this might include number of outpatient consultations, number of vaccinations or number of condoms distributed. These more routinely collected output or process indicators are adequate to capture the scale or volume of activity, using an output-based definition (Kumaranayake and Watts, 2000a).

Applying these to the case of HIV prevention, the unit of analysis might be an NGO project. The project might be designed to increase condom usage, increase access to quality care for management of sexually transmitted infections (STIs) and provide access to information designed to foster behaviour change towards these goals. The project activities could comprise outreach through peer education and distribution of materials, referral of the target group for STI treatment, the development of sources of condom supplies and supporting activities gain the communities' trust. An analysis of efficiency would require outcome indicators such as HIV infections averted or years of life saved. Measures of output would reflect the core activities and could therefore include number of contacts made, number of STIs treated (or referred for treatment), number of condoms outlets, number of awareness campaigns, number of people covered by the project and number of people exposed to programme messages (De Jong, 2001; Lamptey, Zeitz et al., 2001).

In using output indicators, the generalisation of the results of an analysis of scale must be made with caution. There is no consideration of the link between output and the achievements in terms of behaviour change or impact on health or other community development goals that a service might be designed to achieve. Information regarding the outcome and impact of that service can help when attempting to generalise the results in budgeting for project replication. However, data on the impact of HIV prevention services are rarely available as they require expensive epidemiological trials or mathematical modelling (Merson, Dayton et al., 2000; Grassly, Garnett et al., 2002). Similarly behavioural change and successful STI treatment are rarely included as part of routine monitoring and when they are the quality of the data is not always reliable.

Without reliable data on these achievements, an indication of outcome and impact can be ascertained using health services monitoring documentation such as routine behavioural surveys as well as qualitative data from interviews or focus group discussions with health service staff, the target population and project partners (e.g. funders and training organisations).

Further care must be taken when making comparisons across units of analysis with output based indicators if there is a suspicion that production technology varies across these units. The degree of comparability of the routinely collected data that underpin these indicators can only be ascertained through detailed knowledge of the production process at each unit and the context and environment in which activities take place. The production process can vary even across seemingly similar services. For example, one HIV prevention project for commercial sex workers (CSWs) may comprise education, condom distribution and STI treatment whereas the next may include education, condom distribution and the development of a network of health care providers to whom potential STI patients are referred. Comparison of the number of people reached across these different projects is unlikely to be valid as the services provided to recipients from the different projects differ.

Finally, given the multiple activities of health service delivery units it is likely that there will be a range of output indicators to use or to choose from when measuring scale. Again, the choice of measure depends on the research question being addressed. Expanding HIV prevention services from the national or state level perspective might include goals such as increasing the number of people covered by prevention programmes, increasing the number of HIV prevention projects in operation or increasing the number of people working on HIV prevention issues. On the other hand, at the service delivery or project level expanding services might include increasing the number of people covered by the service or a range of volume based indicators such as number of STIs treated, number of condoms distributed or number of contacts made with the target community.

2.8. Conclusions and unanswered questions

The review presented here describes the different terminology and methods used for scaling up in the health services literature, and reveals the weakness in the evidence base regarding the role of contracting out and costs in the scaling up of HIV prevention services. The review found a range of definitions used for the term "scaling up", highlighting the importance of clarity in terminology when defining a research question. The review also found that evidence regarding the effectiveness of an array of methods

used for scaling up health services is still limited, in particular with regards to filling HIV/AIDS service gaps by contracting out. The evidence base on the costs and efficiency of contracting out is even weaker.

Contracting out health services has been found to increase coverage but the understanding of the transaction and production costs of contracting out is limited. In particular, there is limited evidence on the nature of the costs of HIV/AIDS interventions. To obtain a full understanding of the efficiency gains of contracting out to scale up services, any reduction in costs of production needs to be weighed against the transaction costs resulting from the contract.

Production cost data provide information on how to scale up efficiently. Accounting cost studies can provide a measure of average cost and an indication of whether costs are falling or rising with increases in output. By calculating the marginal cost, it is possible to identify the optimal scale of operation and make more accurate estimates of resource requirements for HIV prevention programmes. This can be obtained from econometric estimation. With econometric estimation of a cost function, using the appropriate functional form, it is also possible to explore the impact of exogenous variables on total and average costs.

Transaction cost economics aims to explain the underlying properties of transaction costs and the extent to which they impact on efficiency. The transaction cost framework enables a better understanding of the costs and efficiency of different organisational structures for service delivery, although empirical testing of these concepts is limited due to the practical and conceptual difficulty of measurement. Research into the transaction costs can provide a better understanding of how transaction costs associated with scaling up through contracting out affect the implementation of HIV prevention services and generate hypotheses for future empirical work.

Although the theory of scale economies implies that production costs will vary for different levels of activity, there is limited evidence on scale economies or production costs in HIV prevention services. Furthermore, transaction cost economics predicts that transaction costs are likely to vary with scale of activity and with increasing output they are likely to rise. However, the evidence base is also weak in this area. The transaction cost economics framework has been little applied in the field of health and more specifically HIV/AIDS services.

Major gaps in knowledge exist in the understanding of economies of scale of HIV prevention programmes as well as their transaction costs. Planning for scaling up requires an understanding of the implications of organisational structure, optimal levels of efficiency and resource requirements. Through building the evidence on transaction costs and production costs this can be achieved. The next chapter embarks on addressing this information gap by developing a framework for analysis and identifying the appropriate methodologies to examine these issues.

Chapter 3. Methodology

3.1. Introduction

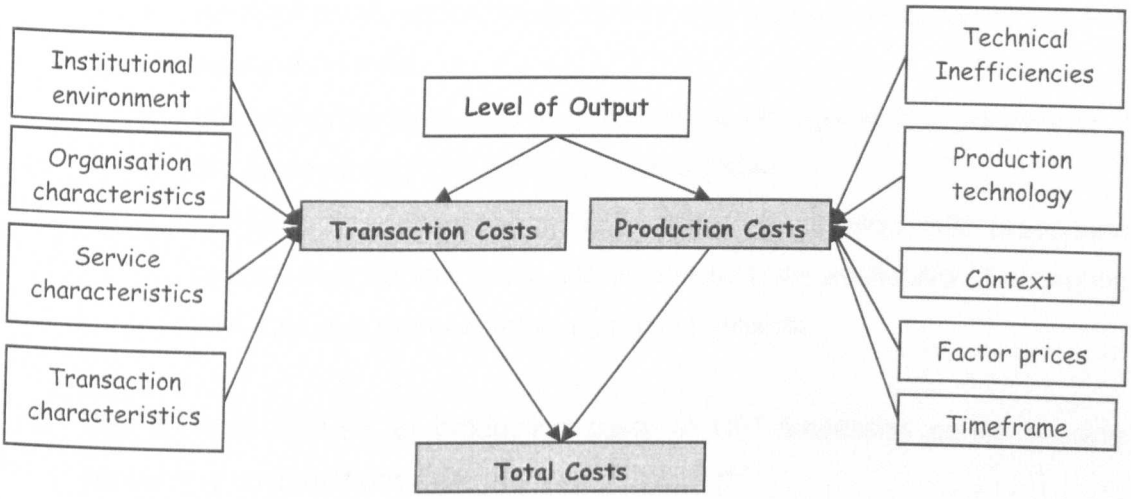
This chapter describes the analytical framework and methods used for sampling and data collection in carrying out the research into the production and transaction costs of HIV prevention services in Southern India. Building on the literature review in Chapter 2, this chapter starts by identifying the framework for analysis and stating the objectives of the thesis. The techniques used for developing a sampling frame and the sampling methodology for the thesis are then described. Following from this, methods used for data collection and the potential limitations arising from the data collection are presented. Specific analytical methods applied in each analysis are described in the specific chapters.

The research for this thesis was funded by the Wellcome Trust under a fellowship awarded to the author. The author was responsible for the design of the analytical framework, data collection and analysis. She was also responsible for the management of the data collection which was carried out by herself with the assistance of her collaborators in India.

3.2. Analytical framework

Based on the theoretical framework laid out in the previous chapters, an analytical framework for exploring the costs of scaling up should incorporate the influence of both the production process and transaction costs. The production process is influenced by the technology, context, prices, timeframe and system inefficiencies, while transaction costs are shaped by the institutional environment, organisation, service and transaction characteristics. The analytical framework for the thesis was developed by the author based on this premise and is shown in detail in Figure 3.1. The framework hypothesises that a combination of the production technology, nature and level of outputs and transaction costs affect the marginal cost. Each of these three factors is, in turn, shaped by the context within which the intervention is implemented. Changes in the output level also depend on existing coverage levels, ease of access to the services and the characteristics of the target population. Governance arrangements influence costs but in turn are influenced by transaction costs which are shaped by the institutional environment, service and organisation characteristics.

Figure 3.1: Analytical framework for analysing how costs change with scaling up



3.3. Methodological framework

As a result of the methodological issues highlighted in chapter 2, the thesis uses both qualitative and quantitative methods to explore the transaction and production costs of scaling up. Production costs are defined as the provider costs of the implementation of HIV prevention services. Transaction costs are defined as the costs of friction in a contractual relationship (Williamson, 1983). Scaling up is defined as the expansion of services to increase output and is examined at two levels. First, production costs are analysed at the level of the service delivery unit. In this analysis the service delivery unit is the NGO HIV prevention project i.e. the set of HIV prevention activities provided by the NGO to the high risk group and financed by a separate funding agency e.g. the State AIDS Control Society. Quantitative cost and output data are used to establish whether production costs vary with marginal changes in output defined by the various project activities and the number of people reached by the project. Second, at the level of the State programme or funding agency, the transaction cost analysis explores the change in organisational form associated with ensuring increased services i.e. the contracting out of services to NGOs. Qualitative data derived from case study HIV prevention projects and their funding agencies are used to establish the transaction costs of increased numbers of NGO contracts held and managed by the funding agency.

To gather the information required for both the qualitative and quantitative aspects of the study, the research comprised four major components with the following specific aims:

1. A mapping survey of NGO HIV prevention projects to establish a sampling frame and assess the feasibility of the study by
    - describing the epidemiology of HIV and national response to the HIV epidemic in India
    - describing the state level response to the HIV epidemic in the context of the epidemiology of 2 high prevalence states
    - carrying out a census of NGO delivered targeted HIV prevention projects in 2 states in India and establishing the availability of economic cost data at a representative sample of projects

2. The in-depth analysis of production costs of HIV prevention services using accounting cost methods, with the specific aims of:
    - Estimating the total costs, average costs and cost profiles for a set of case study HIV prevention projects with a range of scale, experience, governance and location characteristics.
    - Identifying and explaining the causes of average cost variations with particular focus on project scale using quantitative and qualitative analysis

3. The econometric modelling of a cost function for HIV prevention services in order to:
    - Estimate the marginal costs and investigate the existence of economies of scale of targeted HIV prevention projects at different levels of coverage
    - Identify whether some point of minimum efficient scale exists in the implementation of targeted HIV prevention projects, if economies of scale are found to exist
    - Assess the impact of other key contextual factors on total and average costs

4. The analysis and comparison of transaction costs of different governance arrangements for contracting out HIV prevention services to NGOs in India based on information collected from:
    - different state level HIV prevention funding agencies identified in component 1; and
    - a set of case study HIV prevention projects funded by these agencies

The sampling and data requirements for each of these components are laid out in Table 3.1. The author's first step in the research process was to establish the sampling frame. The following section describes the methods used to establish the sampling

frame, select the required case studies for the transaction cost and in-depth production cost analysis and the larger sample of HIV prevention projects for the econometric modeling. It is followed by the methods used for the data collection related to transaction costs and then the methods used to collect production costs.

Table 3.1: Data and sampling requirements for the four components of the thesis

	Mapping survey	*Transaction costs*	*Economic cost analysis*	*Econometric modelling*
Data requirements	Number of NGOs implementing HIV prevention projects; service types; Population reached by NGO projects; Target groups covered; Funding sources and levels of funding; Monitoring systems used; Availability of data for economic cost analysis.	Contractual process; Respect for contractual document; Monitoring mechanisms required; Limitations to process and document; Difficulties and their causes in implementation of requirements; Activities taken to avoid difficulties; Financial flows; plans or ideas of how to proceed with scaling up; History of establishing the existing contractual system	Economic and financial cost data for the full project life-span (to gain insights about how costs change over time, with changes in level of activity and organisational change); Levels of output over project life-span.	Annual economic costs; Levels of output for a single year
Type of services	NGO implemented HIV prevention projects	1 project type targeting a single high risk group		1 project type targeting a single high risk group
Type of sampling	Population census	Case studies		Large quantitative data sample
Sample size	Unknown	8 – 12		Min 30
Data collection techniques	Postal survey; document review; unstructured interviews	Qualitative methods: document review; semi-structured interviews	Cost and output data collection guide recommending document review combined with staff and peer educator interviews	Cost and output data collection guide recommending document review combined with staff and peer educator interviews
Interviewees (where relevant)	NGO directors; Those responsible for HIV projects at funding agencies; Staff of National AIDS programme and state level state aids control societies; Individuals identified through existing knowledge of programme and other individuals interviewed	NGO directors; Those responsible for HIV projects at funding agencies; Senior staff at state aids control societies; Providers of technical support to these programmes; Staff at National AIDS Control Organisation.	NGO staff; Peer educators.	

3.4. Sample

3.4.1. Developing the sampling frame

Between January and March 2002, a mapping analysis was carried out by the author to identify two states in India for the research, to identify an appropriate HIV prevention service for analysis and to assess the availability and quality of data on costs and outputs of the selected service type. The research commenced with a sampling frame of NGO targeted HIV prevention projects in India, based on the importance of these projects to the national programme and the significant role of NGOs in the expansion of HIV prevention services in low income countries. To ensure comparability of outputs across the projects one service type was chosen for analysis, rather than a range of HIV prevention services. The criteria for selecting the service included that it was a priority for the National AIDS Control Programme, that there were a sufficient number of projects implementing this service to fulfil the sampling requirements, and there was sufficient variation in institutional arrangements for the implementation of these services to facilitate comparisons. The criteria are summarised in Table 3.2.

Table 3.2: Criteria for selection of the states and service type for the research

Criteria for selection of the service type	*Criteria for the selection of the states*
• Single service type to enable comparison of outputs in model; • Priority in epidemic control; • Sufficient number of projects to meet sampling requirements; • Diversity of institutional arrangements.	• 2 states to facilitate comparison and test generalisability of model • HIV prevalence among high-risk populations; • Diversity in scale and history to generate relevant data; • A sufficient number of NGOs to meet sampling requirements; and • Diversity of governance arrangements

As a priority component of the national and state level programmes, targeted projects (HIV prevention projects for high risk groups) were selected as the service for analysis (see Chapter 4). To ensure comparability within these, production technology, epidemiology of disease and context of the project were controlled for as far as possible by selecting services targeted at a single vulnerable group as the primary focus of analysis.

As a result of the different demographics, socio-economic characteristics, epidemiology and organisational set up in each state, the thesis uses the state rather than the country as the starting point of analysis. To enable a comparison of different governance arrangements and to examine the influence of contextual factors on costs,

two states were chosen for the study. The selection criteria for the states required them to have an HIV epidemic of concern at the time of the mapping survey (i.e. HIV prevalence rates at antenatal clinics in excess of 1% and epidemics in high risk populations) and sufficient level of activity in the NGO sector. Thus selection criteria included the HIV prevalence rates among antenatal clinic attendants and high-risk populations, an adequate history to generate data, a sufficient number of NGOs working with the state AIDS control programme to meet the econometric sampling requirements and a diversity of governance arrangements (see Table 3.2).

The four Indian states with antenatal clinic HIV prevalence in excess of 1% and epidemics driven by sexual transmission were considered for the study (Andhra Pradesh, Karnataka, Maharashtra and Tamil Nadu). The four states are characterised in Table 3.3 and described in more detail in Chapter 4. The organisational structures for the implementation of the targeted projects vary across and within these states (see Table 3.3). At the time of the mapping phase of the research, of these four states, Tamil Nadu, Andhra Pradesh and Maharashtra were found to fit the research site selection criteria as the state governments were supporting over 40 NGO HIV prevention projects each. Karnataka had recruited 18 NGOs to the targeted intervention programme and was still working in an inception phase. The AIDS control programmes, including both state government and bi-laterally supported programmes, in each of these states were visited. The programme directors were interviewed, programme documents reviewed and key informants (KIs) interviewed to obtain background on the functioning of the programmes, their interest in the research project and feasibility of conducting the costing survey (see Appendix 1 for a list of people interviewed).

Andhra Pradesh and Tamil Nadu were finally selected for the study for a number of reasons: first, the programmes in Maharashtra were in flux due to the inception phase of a United States Agency for International Development (USAID) supported HIV prevention programme; second, access to data in Maharashtra proved extremely slow and difficult; and finally, Andhra Pradesh and Tamil Nadu were supported by different bi-lateral donors resulting in institutional differences worthy of comparison.

The final sampling frame therefore included all NGO HIV prevention projects targeted at CSWs and supported by government or other donors in the states of Andhra Pradesh and Tamil Nadu. Once this had been established, a more detailed mapping survey of NGO HIV prevention projects in each of the states was carried out in order to identify all NGOs working on HIV prevention for high risk groups.

Table 3.3: Demographics, health status and characterisation of the epidemiology and the State AIDS Programmes in the 4 Southern States considered for the Analysis

	Maharashtra	Andhra Pradesh	Karnataka	Tamil Nadu	India
Total Population[1]	96,752,247	75,727,541	52,733,958	62,110,839	1,027,015,247
% rural[1]	57.6%	72.9%	66.0%	56.1%	72.2%
Per capita consumption expenditure, INR 1999/2000[2]	697.4	550.5	638.8	681.4	591.0
Literacy rates[1]	76.9%	60.5%	66.6%	73.5%	64.8%
Infant mortality rate, 1999[3]	48	66	58	52	70
Public spending on health as % of GDP, 1998/9[2]	0.61	1.01	1.61	1.35	n/a
Reported AIDS cases[4]	13,402	11,819	2,478	52,036	109,349
HIV prevalence, 2004 (%) by type of surveillance site[5]					
STD¶	10.4	16.4	12	8.4	
ANC	1.25	2.25	1.25	0.5	
IDU	28 (Mumbai)	n/a	0	39.9	
MSM	9.6 (Mumbai)	n/a	n/a	6.8	
FSW	44.7 (Mumbai)	48.5[6]	-	54.7[7]	
People reporting sex with non-regular partner in last 12 months[8]	11.1	13.3	4.2	3.3	6.6
Consistent condom use with all non-regular partners[8]	60	25	16.5	29.1	32.4
Agencies responsible for contracting with NGOs	MSACS^ MDACS^^ Avert	APSACS~ with technical and managerial assistance from Technical Resource Unit	KSACS~~	TNSACSΔ CAPACSΔΔ APACΔΔΔ	
Bi-lateral donor	USAID*	DFID**	CIDA***	USAID	
Stage of response at outset of study	MSACS and MDACS established prior to NACP2#; Inception phase for new USAID programme (Avert)	Merging of well established DFID supported and APSACS programmes in 2001	Inception phase of bi-lateral programme	TNSACS programme established prior to NACP2#; CAPACS in start up phase; APAC at end of phase 1 & moving into expansion phase;	
Number of Targeted Interventions (TIs)	MDACS-16, MSACS-30	101	18	TNSACS-65, CAPACS-7, APAC-31	
Of which sex worker projects:	MDACS-6, MSACS-9	18	13	TNSACS-21 CAPACS-2 APAC-6	

[1] (Census of India, 2001); [2] (Government of India, 2002); [3] (Government of Maharashtra, 2002); [4] (National AIDS Control Organisation, 2005b); [5] (National AIDS Control Organisation, 2004c); [6] (Bhuyan, Shobarani et al., 2001); [7] (Wilson and Shiv Kumar, 2001); [8] (National AIDS Control Organisation, 2002);¶STD = Clinics for sexually transmitted diseases; ANC = antenatal clinics; IDU = injecting drug users; MSM = men who have sex with men; FSW = female sex workers. *United States Agency for International Development; **Department of International Development (UK); ***Canadian International Development Agency; ^Maharashtra State AIDS Control Society; ^^Mumbai District AIDS Control Society; #National AIDS Control Programme 2; ~Andhra Pradesh State AIDS Control Society; ~~Karnataka State AIDS Control Society ΔTamil Nadu State AIDS Control Society; ΔΔChennai Corporation AIDS Prevention and Control Society; ΔΔΔ USAID funded AIDS Prevention and Control project.

3.4.2. Sample selection

3.4.2.1. Mapping of HIV prevention projects in Tamil Nadu

NGOs implementing targeted HIV prevention projects and their funding agencies were identified by key informant interviews and document review carried out by the author with the support of a research assistant. Key informants were selected again through document review and snowballing. A list of people interviewed is contained in Appendix 1. These processes were also used to understand the number of NGOs funded, overall programme expenditures, methods used for planning, monitoring and evaluation of the NGO programme and coverage achieved for each identified funding agency. Second, a structured questionnaire was designed by the author to gather information with respect to HIV and non-HIV related services and activities, geographical location, population coverage of HIV activities, type of provider, size, budget and funding sources, age of organisation and availability of monitoring and evaluation data, from each NGO identified (see Appendix 2). The questionnaire also sought an agreement to participate in the cost analysis if their project was selected. This was posted or emailed to all the NGOs identified. The questionnaire was pilot tested at 3 NGOs within Chennai in November 2001 and was subsequently revised. The questionnaire was sent to all NGOs identified in Tamil Nadu in January 2002.

An MS Access™ database was developed for data entry. One research team member was trained in MS Access and structure of the database itself. Data were entered as the completed questionnaires were received.

3.4.2.2. Mapping of HIV prevention projects in Andhra Pradesh

In Andhra Pradesh, it was found that a census of NGO HIV/AIDS activities had already been carried out before this study's mapping survey commenced (Lepra India, 2002). Beyond the Andhra Pradesh State AIDS Control Society (APSACS) programme, no other targeted NGO projects were identified from this survey (Lepra India, 2002). To avoid duplication and to avoid repeating the low response rate in Tamil Nadu (see Chapter 4), the postal survey used in Tamil Nadu was sent only to those projects working with commercial sex workers in AP (the type of project finally selected for the analysis, see Section 3.4.2.4). Information on the number of NGOs funded, overall programme expenditures, methods used for planning, monitoring and evaluation of the NGO programme and coverage achieved by the programme was obtained from the Technical Resource Unit (the technical agency responsible for managing the APSACS NGO contracts) and APSACS through interviews and document review. NGO characteristics for the broader set of projects funded by APSACS, relating to HIV

experience, organisation expenditure and staffing and project coverage were obtained through a simplified postal survey of all NGOs contracted by APSACS (see Appendix 3). This was sent out to all NGOs that had been under contract with APSACS to deliver targeted HIV prevention projects (n = 101). After follow up with phone calls, 82 (81.2%) of the NGOs responded. The data from this survey were entered into an MS Excel spreadsheet by a member of the research team and data entries cross-checked with the survey forms by the author.

3.4.2.3. Assessing the quality of available data

As well as describe the nature of the NGO targeted HIV prevention projects, the mapping survey also set out to assess the quality of information available for an economic cost analysis at a representative sample of these NGOs. Economic costing requires the understanding of all resources used and includes those inputs that may not be reflected in the financial costs as well as the outputs generated by the service. Routine monitoring systems can be used to collect output data and therefore they were evaluated to see if they met the costing requirements. In addition, economic costing requires documentation of activities and inputs, expenditure records and input prices. The survey therefore requested information on the indicators recorded as part of monitoring systems. Interviews with funding agencies and NGOs sought to assess the availability and quality of this information (see Appendix 1). A convenience sample of eleven NGOs in Tamil Nadu and 5 NGOs in Andhra Pradesh were visited by the author to confirm the types and quality of information recorded at the NGO level. Where possible records themselves were examined to verify statements made in the interviews and the degree to which planned monitoring and evaluation activities were followed and recorded.

3.4.2.4. Selection of the case studies

A focussed sample of NGOs from each state was selected for the economic cost and transaction cost analyses based on the results of the mapping survey. A case study approach was used in order to enable in-depth insights and to ensure the collection of full economic costs, required for understanding how and why costs might vary. The selection process aimed to identify NGO projects that would be able to explain the impact on costs of the governance arrangements and to gain further insights into how production costs change with scale. Given the consistently high numbers of CSW projects, relative to the other targeted HIV prevention projects, across the states, it was decided to focus the case study sample on CSW projects.

Projects were selected from different states, funding agencies and with different funding histories in order to explore the influence of different institutional arrangements and funding mechanisms on services delivered through similar production processes. The results of the mapping survey were used to group the NGOs according to the different states and funding agencies. The NGO projects were then selected, using the survey results and consultation with the funding agencies, based on their institutional arrangements, geographical location, HIV experience, availability of cost and output data and the funding agency's knowledge of the quality of their services.

Permission was requested to carry out the work from the National AIDS Control Programme as well as the funding agencies and their NGO partners (letters of permission are provided in Appendix 4). In the case of Andhra Pradesh, APSACS and their bi-lateral donor (DFID) agreed to the study and they requested the NGOs to cooperate with the study. In this way, all 9 NGOs working on CSW projects that were selected participated in the study. In addition, 2 NGO projects working with trucker populations were included in the case studies. These projects were added to help provide insights into differences in transaction and production costs across target groups and historical differences in funding arrangements for targeted HIV prevention projects in Andhra Pradesh (see Chapter 4), although there are limitations in the potential to make generalisations from such a small sample size.

In Tamil Nadu, four different funding agencies were identified: AIDS Prevention and Control (APAC); the Chennai Corporation AIDS Prevention and Control Society (CAPACS); Christian Council for Rural Development and Research (CCOORR); and the Tamil Nadu State AIDS Control Society (TNSACS). On first approach APAC provided permission for the study and facilitated access and permission from their partner NGOs. Verbal approval was received from their funders, USAID. Unfortunately, this permission had been granted prematurely and USAID subsequently withdrew permission resulting in the withdrawal of APAC and their NGO projects from our sample. Permission was obtained from CCOORR. They then facilitated access to their NGO partners, two of which were selected for the study based on geographical location and experience.

Given the NGO focus of the study, TNSACS and CAPACS required the research team to seek permission from the NGOs themselves. Only 5 of the 38 NGOs funded by these agencies completed the statement agreeing to the cost analysis in the postal survey. Of these only two were CSW projects. The research team therefore contacted each of the CSW projects that had not replied or had not provided permission (n=17).

The only two CSW projects working with the Chennai AIDS Prevention and Control Society at the time of the survey agreed to participate in the cost analysis. Of the 21 named CSW projects funded by the Tamil Nadu State AIDS Control Society, it was discovered through the survey and interviews that many were not so focussed and actually covered a broader range of target groups. Furthermore, some NGOs proved impossible to reach by courier, telephone and even telegram. Due to this, 4 NGO projects were selected based on three criteria: the knowledge that they targeted CSWs, derived from visits to the NGOs and discussions with TNSACS; that they were geographically dispersed across the state; and that they responded to phone calls or email.

3.4.2.5. Selection of a sample for the econometric modelling

Based on the review of the hospital and health services literature, a sample size of a minimum of 30 projects was found to be required for the econometric modelling (Barnum and Kutzin, 1993a; Wouters, 1993), although this number is also dependent on the number of explanatory variables included in the model (Dougherty, 2002). Small sample sizes will inevitably restrict both the choice of functional form and the number of variables that will be permissible in the model to obtain significant results.

From the mapping analysis 29 and 20 projects working with CSWs were identified in Tamil Nadu and Andhra Pradesh, respectively. At the outset of the study it was planned to carry out economic costing at all these projects to create a sample of cost data from a single service type that was large enough to be used in the econometric modelling. This approach was reconsidered during the initial stages of the fieldwork. The sampling problems encountered in the case study sample selection led the research team to believe it would be difficult to achieve a large enough sample this way (see Section 3.4.2.1). In addition, the pilot testing of the costing tools (see below) indicated that the time required to carry out economic cost analyses at all forty-nine projects would be beyond the feasible timeframe of the fieldwork. To ensure a large enough sample, it was therefore decided to collect financial data, in the form of annual reported expenditures, and output data, in the form of routine monitoring indicators, from NGOs both working with the four major funding agencies identified and willing to participate in the study. This information could then be supplemented by information regarding the NGO characteristics from the postal surveys. Financial cost information can provide insights into how expenditures might change with different levels of activity. Although the data do not provide as complete a picture as economic cost data, they can suggest patterns and the impact of different factors such as scale or target group on the average cost.

Further review of the available data at the funding agencies was then carried out to assess the feasibility of this approach. The quarterly monitoring reports at TNSACS were full of gaps and inconsistencies that were indecipherable so that annual figures on both expenditures and outputs could not be compiled for the majority of NGOs. The samples of projects at CAPACS (n= 8) and CCOORR (n=4) were too small to be considered for an econometric model. Only at APSACS were data of adequate quality and availability to be included in the sample. It was therefore decided to use these data for the econometric modelling.

3.4.2.6. Implications of the sampling process for the thesis

Difficulties encountered in the mapping survey and sample selection led to some significant changes in the sampling approach and plans for the data collection. Table 3.4 mirrors Table 3.1 but provides an overview of the revised sampling approaches used for each of the components of the study and how they varied from the original research plan. It also summarises the final data collection techniques used and how these were adapted as a result of the mapping survey. The final data collection approach comprised: two postal surveys for the mapping analysis and econometric modelling – one in Tamil Nadu and one in Andhra Pradesh; semi-structured interviews and document review for eliciting information on transaction costs; economic cost data collection at the case study NGOs; and a review of expenditure reports for compilation of financial data for the econometric model.

The two postal surveys have been described in 3.4.2.1 and 3.4.2.2, above. The survey of NGOs had some limitations in terms of achieving the objectives of assessing the feasibility of the cost analysis. Firstly, initial response to the postal questionnaires was lower than hoped in spite of follow up with telephone calls and emails and a series of NGO visits to raise the response rate. Of the 133 NGOs identified only 48 responded. However, an agreement with TNSACS was established to use their monitoring records that would provide information on coverage and financial expenditures. A rapport with the major funding agencies also allowed insights into the nature of the some of the non-responding HIV prevention projects and so strengthened our sampling frame. The low response did result in a limited overview of small scale projects that were not supported by the major funding sources interviewed as part of the research in Tamil Nadu. Unfortunately, it is not possible to assess the direction of any resulting bias.

Second, terminology related to coverage of the target population used in the questionnaire appeared to be relatively new to many of the NGOs. This resulted in

some uncertainty in the responses, in spite of the pilot test. Further clarification of responses was sought through NGO visits, email and telephone correspondence to address this as far as possible. Thirdly, and also related to coverage, where projects are working with more than one target group it was not possible to break the coverage data down by target group and in most cases no estimate of the size of the target group living or working in the intervention area was available. In addition, it was not possible to assess the quality of the coverage data through the postal survey. It was felt, however, that these issues could be addressed during site visits for the production cost analysis.

Finally, APAC denied access to their NGOs. This narrowed the sampling frame for both the production and cost analyses. As anecdotal evidence suggests that these NGOs had both high coverage and higher expenditures it is unclear whether average costs in a sample of APAC NGOs would be higher or lower than in NGOs supported by TNSACS or APSACS. Again from anecdotal evidence, it is likely that the transaction costs are high in the APAC model due to intensive monitoring and supervision and dependence on external consultancy support. However, as the APAC programme operates independently of government, the lessons learnt are of less relevance to government supported programmes in other states than those of the State AIDS Control Societies.

The following section describes the techniques for the collection of data on transaction and production costs.

Table 3.4: Sampling approach and data collection techniques used in the thesis, following the mapping survey

	Transaction costs	*Economic cost analysis*	*Econometric modelling*
Data requirements	Contractual process; Respect for contractual document; Monitoring mechanisms required; Limitations to process and document; Difficulties and their causes in implementation of requirements; Activities taken to avoid difficulties; Financial flows; plans or ideas of how to proceed with scaling up; History of establishing the existing contractual system	Economic and financial cost data over a one year period	Expenditures and outputs as reported to the funding agency for a period of one year.
Reason for difference from plan, if any	No difference	Historical data availability and timeframe for study limited the analysis to a one year timeframe	Data availability; access to NGOs and time required for economic cost analysis led to review of approach and decision to use financial data
Type of services	Projects targeted at commercial sex workers only, except for 2 trucker projects in Andhra Pradesh		Range of different target groups including commercial sex workers; men who have sex with men (MSM); street children; transgenders; truckers; and slum dwellers
Reason for difference from plan, if any	2 trucker projects from AP included to examine the impact of their different historical governance arrangements on transaction and production costs		Large enough sample size obtained from the financial data approach to allow for exploration of impact of target group on costs in econometric model
Type of sampling	Case studies		Large quantitative data sample
Sample size	Tamil Nadu – 8; Andhra Pradesh - 11		Andhra Pradesh - 78
Reason for difference from plan, if any	Greater number of agencies in Tamil Nadu and historical development of AP programme requires capturing impact of greater variety of governance arrangements within each state as well as the experience and organisational variations		Larger sample size as switch to financial rather than economic cost data; Missing expenditure and other monitoring reports in Tamil Nadu led to exclusion of Tamil Nadu NGOs from the analysis.

Table 3.6 (cont): Sampling approach and data collection techniques used in the thesis, following the mapping survey

	Transaction costs	*Economic cost analysis*	*Econometric modelling*
Data collection techniques	Qualitative methods: document review; semi-structured interviews	Cost and output data collection guide recommending document review combined with staff and peer educator interviews	Collection of reported expenditures at funding agency; postal survey
Reason for difference from plan, if any	No difference	No difference	Data availability; access to NGOs and time required for economic cost analysis led to review of approach and decision to use financial data
Interviewees (where relevant)	NGO directors; Those responsible for HIV projects at funding agencies; Senior staff at state aids control societies; Providers of technical support to these programmes; Staff at National AIDS Control Organisation.	NGO staff; Peer educators.	

3.5. Data collection

3.5.1. Production costs

At the outset of the research it was planned to collect financial and economic production cost data covering the period of one year from a large sample of NGO projects for the econometric modelling. In addition, to gain further insights into how costs change with scale and the role of time in this relationship, economic cost data for the entire project life time were to be collected from the case studies. The difficulties in achieving the sample size required and in gaining access to historical data and the data collection duration observed in the pilot testing led to the decision to collect annual cost data from the case studies and to seek out expenditure data for the econometric model (see Table 3.4). This section therefore lays out the methods to collect annual financial and economic cost data of the HIV prevention projects from the case study NGOs, to collect expenditure data for the econometric model and to measure scale at the service delivery level.

3.5.1.1. Collecting financial and economic cost data

Information collected

Financial and economic cost data were collected from each of the case studies between December 2002 and May 2003 and cover the financial year April 2001 to March 2002. The cost analysis takes the perspective of the provider of HIV prevention services. This includes costs incurred at the project level and the technical support, monitoring and contractual management costs of the agency responsible for funding and managing the project. Where possible the ingredients approach to costing is used (see, for example: (Creese and Parker, 1994; Kumaranayake, Pepperall et al., 2000)) so that all inputs to production are quantified and unit prices subsequently attached to each unit of input.

Data collection methods

Four research assistants, 2 from each state, were trained by the author for the data collection and entry. The author visited each of the projects to gain an understanding of the functioning of each of the projects and closely supervised the data entry into the UNAIDS costing worksheets adapted for the purpose of this study (UNAIDS, 2000b). In Andhra Pradesh, the study and its methods were introduced to the NGOs in a workshop attended by the project directors and managers of all the participating NGOs.

Although a basic understanding of the principles of cost analysis was conveyed during this process, it was found that the English language ability of the workshop attendees limited their ability to fully comprehend the purpose of the study. It was concluded that introductions to the study were better made through one-to-one meetings. As a result the workshop was not repeated, as had been planned, in Tamil Nadu.

A two part structured questionnaire used as a guide for the data collection was piloted at one NGO project in each state in December 2002. The questionnaire format was found to be too inflexible to ensure the collection of all cost data. The questionnaire was therefore adapted into a fieldwork guide which was then used for the data collection at the remaining projects (see Appendix 5). A separate questionnaire was used to collection information about peer educators' time and value of time (see Appendix 6). Information was required to first identify the inputs to production and then value those inputs.

(i) Input identification

Inputs were identified through a description of activities using project documentation and interviews with personnel at the NGOs and funding agencies. They were classified as fixed and variable according to a combination of standard definitions i.e. variable inputs are those that vary with changes in output, whereas fixed do not (see Table 3.5) (Creese and Parker, 1994).

Table 3.5: Classification of fixed and variable costs

Classification	*Costs included*
Fixed costs	All agency level costs (including training and educational materials) Building and office rent and running expenses Equipment and vehicles Training Monitoring Project personnel (Project Director, Project Manager, administrative and other support staff)
Variable costs	Project personnel (outreach staff) Peer educators Condoms Educational materials STI treatment costs Meetings Transport

Note: STI = sexually transmitted infection

Where quantities were not available, expenditures on the items, as reported in financial statements, were used to represent the input levels. This latter approach was used for buildings and associated expenses, office running expenses, transport and meetings at both the NGO and agency levels of analysis. All staff budgeted to work full time on the projects were assumed to do so. Key staff members (e.g. the project manager or

director) were interviewed to ascertain the time inputs of other personnel. The hours per month of peer educators' involvement in project activities were estimated from interviews with the peer educators and included in the economic costs. Information derived from these peer educator interviews was cross-checked with the outreach staff.

STI treatment at the projects takes the form of provision of clinic services, the provision of a subsidy or referral for care. As a result, categorising the inputs to STI treatment along with the other project activities blurs the differences in production technology used by the projects. To enable valid comparisons of cost profiles across the HIV prevention projects with these differing technologies, STI treatment was considered an input category in itself. Where symptoms treated were readily identifiable in the project records, this information was used, in combination with syndromic case management guidelines, to identify the drugs used for treatment (National AIDS Control Organisation). Where the NGO had their own STI clinics, the inputs of physician time and drugs purchased were measured over a one year period, a time period long enough to provide a reasonably accurate estimate of actual drug use. In the case where records were unavailable, it was only possible to estimate an average drug dosage per patient with the use of the total number of STIs, STI symptom prevalence data from Andhra Pradesh (Bhuyan, Shobarani et al., 2001) and the syndromic case management guidelines (National AIDS Control Organisation).

Funding and technical support agency inputs are allocated to each NGO project using different methods according to the agency and line item. At APSACS, educational materials, training and project officers are allocated based on number distributed, sessions attended and number of NGOs under their responsibility, respectively. All other agency inputs at APSACS and the other funding agencies are allocated equally across all the contracted NGOs by each agency.

(ii) Cost valuation

Financial costs are valued at the purchase price as recorded in expenditure statements or receipts held at the project. Economic costs are valued using local market prices collected from local retailers, unless otherwise stated. In the case of budgeted personnel, it was assumed that salaries, including benefits, reflect the opportunity cost of time. The values of non-budgeted personnel and peer educators were obtained from interviews with the respective individuals, the project director and outreach workers. Where it was possible to interview the peer educators, their time was ascertained through a simple bidding game. The bidding commenced by asking the individual for the minimum daily wage they would work for in non-sex work activity.

Subsequently the bid was halved and doubled until the response converged on a single value. These values were then validated in interviews with the outreach staff, who also supplied peer educator income estimates when interviews were not possible.

STI drug prices were taken from a directory of all current drug prices for India (Drug Today, 2003). For the value of educational materials, we obtained price information from the marketing agency contracted to supply such materials to the APSACS programme and local printing shops. The cost of training was extracted from accounting records. Condoms distributed for free were valued using the price of the lowest cost alternative in the market i.e. Nirodh Deluxe, a subsidised socially marketed condom. As there were no data at any of the NGOs on the revenue from condom sales, it was assumed that all costs were re-couped and the net cost of condom sales (i.e. cost of condom procurement – revenue from sales) was zero.

Capital costs were annualised. The annual financial cost is calculated by dividing total cost by the expected length of life of the capital item. Annualised economic costs were calculated using a standard discount rate of 3% (see for example (Drummond, Stoddart et al., 1997)). Capital items were assumed to have a life of between 3 and 10 years depending on the item based on consultation with project staff and suppliers of similar products (see Appendix 7). All costs are presented in constant 2003 prices and converted using the GDP deflator (Reserve Bank of India, 2003).

Limitations

Due to the retrospective nature of the data collection, several constraints were faced in obtaining full information required for the cost analysis relating to missing data, inaccuracies in the data and where price measures had to be used in place of cost.

Systematic records on quantities of educational materials and training sessions were not available. Similarly, records of condom revenues were either not kept or not made available and it was unclear in many cases what the revenues were used for if retained by the organisation. In addition, some indicators of coverage and volume were also missing and not standardised across the funding agencies i.e. coverage indicators for two NGOs and volume indicators related to contacts for the TNSACS NGOs were missing.

Inaccuracies in the data are related to a number of factors. First, the data contained the usual flaws and mis-reporting to which all routine monitoring systems are subject. Second, the values obtained for peer educators' time and income are constrained by

the limited numbers available for interview, drunkenness or false replies resulting from the CSW expectations of the interviewers. The bidding game was kept as simple as possible to minimise errors arising from misconceptions and drunkenness. The outreach workers were also interviewed to fill in gaps in peer educator information and validate the responses to minimise these errors. Third, there was a tendency for project directors' to under-estimate incomes or, where the research team were perceived as evaluators, a tendency to over-report time spent on the project. Finally, STI treatment records were not available at all sites. In these cases, the numbers of syndromes treated were estimated using the average prevalence for the only available CSW specific data on prevalence for the region, previously collected from two of our case study sites (Bhuyan, Shobarani et al., 2001).

Where quantities of inputs were not available, e.g. building space, transport and community meetings, prices have been used to represent costs. These data might be a better reflection of the budget than the resources used, as expenditures tend to be budget driven. This approach also limits the analysis from looking at the relationship between the production and cost function for these particular items.

3.5.1.2. Collecting expenditure data for the econometric model

Information collected

The expenditure data used for the econometric model comprised the NGO expenditure reports submitted to the agency responsible for managing the NGO contracts for APSACS. These expenditures differ from economic costs in that they include only the resources used for which there is a reported financial transaction and they value those resources at the price used in that transaction. Economic costs would include the value of all resources employed to produce the service valued at their opportunity cost. This financial data set is therefore not comparable with the case study data set which comprised economic cost data.

Data collection methods

Expenditures were obtained from the audited quarterly statements of expenditure covering the contractual period 2001/02. These were collated and entered into an MS Excel spreadsheet by the research team. Quarterly expenditures were entered by line item and summed to obtain annual expenditures. The expenditure statements were broken down by line items that varied across the expenditure reports. These line items were then grouped by the author into the major categories of personnel, office expenditures, behaviour change communication, peer education, condoms, sexually

transmitted infection management, creating an enabling environment, training, travel, monitoring and evaluation and other. The totals were cross-checked against the expenditure reports. Where discrepancies were found, the causes were identified and corrections to the data made.

The postal survey of all the APSACS projects (see Section 3.4.2.2) was used to obtain project-reported information regarding project coverage and NGO organizational characteristics (see Appendix 3). Other contextual factors hypothesized to influence average cost were collected from the NGO contract management agency. These data were entered into a separate MS Excel spreadsheet. The two spreadsheets were then merged.

Limitations

The financial dataset is subject to the flaws of much accounting data including mis-reporting and false claims and the need for line item expenditure to match line item budgets. However, this is most likely to affect the proportion of spending on individual line items rather than total cost as projects are likely to adhere to the overall budget. In addition, the financial dataset pertains only to expenditures at the NGO level and therefore excludes the agency level category of costs including training, monitoring and evaluation and other support provided by the funding or management agencies (see Table 3.5).

3.5.1.3. Collecting measures of scale

Information collected

For the production cost analyses, scale was interpreted as the volume of services and ultimately coverage of the population. It was therefore measured using the different indicators of coverage and volume as defined in Table 3.6. These are all indicators collected as part of routine monitoring systems and recommended by the National AIDS Control Programme. To ensure clarity in this analysis, the number of people reached is referred to as "*coverage*" and the remaining indicators of scale as descriptors of "*volume*".

Table 3.6: Definition of the Output Measures

Indicator	*Indicator*	*Definition*
Coverage	Number of target group reached (coverage)	The number of people reached by the project.
Volume	STI* referrals	The number of people referred to health care providers by the project for consultation on sexually transmitted infections
	STIs treated	The number of people that have been treated for sexually transmitted infections by project partners as a result of the project referrals.
	No. of condoms distributed	The number of condoms distributed is the number of condoms distributed to the target group – both free and through social marketing.
	Contacts	Three measures of contact are used in the monitoring reports: • 1st project contact with an individual in the target group; • The number of all contacts (1st and repeat) with members of the target group; and • The number of all contacts (1st and repeat) with external stakeholders – those linked to the target group but not the primary focus of the project. (They are reported here as number of 1st target group contacts, the number of all target group contacts (sum of 1st and repeat) and all contacts (sum of total target group contacts and contacts with external stakeholders).

* STIs = sexually transmitted infections

For the transaction cost analysis, scale was considered from the perspective of the funding agency and its efforts to implement more HIV prevention projects by issuing increasing numbers of contracts.

Data collection methods

The number of contracts issued by the funding agencies was collected from documentation at the respective funding agencies. The ease of ascertaining the number of contracts held by the different funding agencies varied according to the agency. At APSACS records of the NGOs contracted to deliver HIV prevention services were clear and up-to-date. It was also evident which NGO contracts had been terminated. However, the wealth of documentation from different sources on the number of NGOs working with the funding agency TNSACS provided conflicting data and led to a range of different numbers. This problem was addressed in a visit to India following the main period of fieldwork in an interview with the new NGO advisor. He was requested to complete a small questionnaire for the research team and the numbers provided his response were taken as final.

The production cost analyses scale measures were collected as part of the economic cost data collection process at the case study NGOs, through review of monthly monitoring reports. For the econometric model, the data were requested in the postal survey sent to all APSACS NGO projects (see Section 3.4.2.2 and Appendix 3).

Limitations

As with the production cost data the quality of the information on output is subject to the flaws and mis-reporting of all routine monitoring systems. However, there were some further problems related to each of the specific indicators. The measure of coverage was taken to mean the number of the target group reached by the organisation. This implied that the number of people that had had some minimal level of contact and been provided with education regarding HIV prevention and behaviour change. However, the level of contact and education provided may not have been consistent across the projects and it was not clear in the records whether the number recorded is cumulative across the years. Given that the reports refer to the current year of activity and current contract, it was assumed that these are annual rather than cumulative figures.

In the case of sexually transmitted infections treated, it was found that in general only those that have been treated with expenses covered through the project budget were recorded in the monitoring reports, leading to a probable underestimate of the true number of people treated. On the other hand, the indicator did not distinguish between first and repeat visits to the health care provider. This leads to double counting which in some cases was deliberate. Where the cost of STI treatment is reimbursed by the funding agency and if the reimbursement level is too low, clients are encouraged to make two visits to the health care providers, claiming from the NGO each time and therefore covering the cost of the full course of treatment.

The fourth measure of output, the number of condoms distributed, is heavily influenced by available supply and can be easily exaggerated through dumping of condoms where they are never likely to be used. Finally, the number of contacts suffers from definitional problems in that the nature of a contact can range from an introduction to an individual to a long discussion on the issue of HIV prevention.

3.5.2. Transaction costs

Information collected

A qualitative approach was applied to gain information regarding the transaction costs of contracting. Information was collected on the process of designing and negotiating the contract, the nature of monitoring mechanisms for the contract and actions taken to ensure the contract is enforced during the implementation period. The Williamson framework was used to characterise the nature of the transaction costs and to enable a comparison of the transaction costs across the different institutional models (see section 2.7.2.1). To achieve this, transaction cost-specific characteristics of the contractual arrangements were noted, particularly those pertaining to asset specificity, bounded rationality and opportunism (see Chapter 2). Information was also sought to establish whether these governance arrangements would suffice for the further expansion of activities and to understand what changes would be needed to enable further scaling up. The time period covered by the data extended from approximately June 2001 to April 2003.

Data collection methods

Data collection took the form of semi-structured interviews and document review and was complemented by background information on the institutional environment compiled during the mapping survey. Documentation such as programme and project descriptions and annual and quarterly reports were reviewed at the funding agencies, technical support organisations and NGOs themselves. The semi-structured interviews were carried out between December 2002 and May 2003 by the author (a white, non-Indian female, with no local language knowledge) in the presence of a research assistant from the state in which the project was located, following an interview guide (see Appendix 8). They were carried out with the directors, finance managers and those responsible for the management of the HIV prevention projects at the contracting and NGO management agencies, project directors and project managers at the NGOs and a set of key informants (KI). Key informants were identified during the process of data collection and included those individuals found to have extensive either current or historical knowledge of one or all the HIV prevention programmes. In the case of NGO personnel the interviews took place during the site visits made for the economic cost data collection (see 3.5.1.1 p.88).

The interviews were conducted in English. In the majority of cases, the interviewees were Indian with English as a fairly fluent second language. If a problem of language arose, the research assistant translated questions and responses. However, English

language ability was sufficient that it was not necessary for any of the interviews to be wholly conducted in a local language. Where permission was granted, interviews were taped and transcribed by the author. Notes were taken by both the author and research assistant and cross-checked against each other and the transcriptions, where available, for consistency. The interviews and document review were complemented by the author's and research assistants observations recorded following on-site visits.

Limitations

With regards to the information that could be generated from the semi-structured interviews several limitations need to be acknowledged. First, many of the NGOs perceived that we came from their funding agencies, in spite of explanations that we were not. Their answers could have been shaped by this perception. Second, there were unexpected differences between Indian English and British English, which complicated the explanation of some issues and possibly led to mis-understandings or mis-interpretation of questions and responses. Finally, interviews were not taped if the interviewees either denied permission or were found to be uneasy with the presence of a tape recorder. Although the notes of the interviewer and the research assistant present were cross-checked against each other, it is recognised that there can be flaws in note taking and they can be more prone to the inclusion of subjectivity than taped and transcribed interviews.

In addition to the interview material, documentation was subject to some uncertainty. Documentation sourced for the study was mixed in quality and in some cases undated. In addition, there were conflicting figures on expenditures, coverage and number of NGO contracts given in different documents. It was often difficult therefore to discern the reality. Where a single number was required to make comparisons or descriptions, official figures as reported to the National AIDS Control Organisation (NACO) were used. The level of uncertainty in reporting also served as an important finding in the thesis.

3.6. Research permission and ethical approval

Consent for the study was sought and given at the levels of the National AIDS Control Programme, funding agency and NGO prior to data collection (see Appendix 4 and 3.4.2.4). As described above this was not granted by USAID which therefore limited our sample. Ethical approval was granted by the ethics committee at the London School of Hygiene and Tropical Medicine according to the ethics application provided in Appendix 9. In addition, ethical approval was sought in India through IIT(Madras), the research project collaborators. Ethical approval was not required by the Indian

National or State Governments for a study focussed on the organisation rather than the individual.

Chapter 4. Mapping of HIV prevention services in Southern India

4.1. Introduction

This chapter present the results of the mapping survey of the delivery of targeted interventions for HIV prevention in Southern India. As described in Chapter 3 the mapping survey was carried out to develop a sampling frame for the production and transaction cost analyses. Its specific aims are to:

- describe the state level response to the HIV epidemic in the context of the epidemiology of 2 high prevalence states
- present the results of a census of targeted HIV prevention projects that was undertaken in 2 states in India to identify HIV prevention projects for the costing sample and assess the feasibility of carrying out economic cost data collection at a representative sample of NGO interventions

The situational analysis begins with an overview of the epidemiology of HIV in India and the national response to the epidemic. Next, the chapter summarizes the epidemiology and responses at the state level in the four states considered for the analysis. Finally, the methods and results of the surveys in the two selected states are presented.

4.2. The national response to HIV/AIDS in India

4.2.1. Historical background

The number of people estimated to be living with HIV/AIDS in India in 2005 was 5.7 million concentrated in the six states of Andhra Pradesh, Karnataka, Maharashtra, Manipur, Nagaland and Tamil Nadu (National AIDS Control Organisation, 2004a; National AIDS Control Organisation, 2005a; UNAIDS, 2006) (see chapter 1). The national response to the HIV/AIDS epidemic in India was initiated in 1986 with a national surveillance programme and mass media campaigns focussing on risky behaviours to raise general awareness. In spite of this early and commendable action, the response met with continued denial and was reported to be generally inadequate (Dube, 2000; YouandAIDS: the HIV/AIDS portal for South and North-East Asia, 2002a; Solomon, Chakraborty et al., 2004). Rather than fostering prevention and safer behaviour, much of the early prevention effort led to stigmatisation of vulnerable groups (Dube, 2000). In 1991, the realization of the threat and the commitment arising from a World Bank loan to the Government of India (GOI) for a National AIDS Control

Programme (NACP) led to increased action (Solomon, Chakraborty et al., 2004). In spite of progress in the following years in the areas of blood safety and public awareness, HIV prevalence soared among high risk groups (Solomon, Chakraborty et al., 2004). The programme made little progress largely due to lack of political commitment at the state level and expenditure falling consistently below the budgetary allocation (personal communication National AIDS Control Organisation, Director Finance, 2002) and (Imam, 1994).

4.2.2. The current phase of programming

With the epidemic accelerating, the second National AIDS Control Programme (NACP2) was launched in 1999, with a five-year loan from the World Bank as well as Government of India and bi-lateral funding. The NACP2 budget is INR 14,251 million (over USD 327 million[4]), later extended for 2 years and revised upwards to INR 20,647 million (USD 474 million), see Table 4.1 (National AIDS Control Organisation, 2000b; National AIDS Control Organisation, 2004a). An effort to decentralise the programme to the state level has been realized through the creation of state AIDS control societies (SACS). These are quasi-governmental organisations that receive funding direct from the National AIDS Control Organisation (NACO) rather than through the state health budget and are responsible for the implementation of the state AIDS programmes. This builds on the successful model first implemented in Tamil Nadu that was found to improve fund absorption and has led to a stabilisation of the epidemic (National AIDS Control Organisation, 2000b; Ramasundaram, Allaudin et al., 2001).

The State AIDS programmes implemented by the SACS comprise 5 main components: 1. Priority interventions[5]; 2. Preventive interventions for the general community; 3. Low cost AIDS care; 4. Institutional strengthening; and, 5. Inter-sectoral collaboration.

[4] Exchange rate: USD 1 = INR 43.56 (www.oanda.com accessed 14th July, 2005)

[5] This includes both targeted prevention programmes for high risk sub-populations and referral and treatment of STI patients

Table 4.1: Financing of the National AIDS Control Programme, Phase 2 (1999-2004), millions INR (current prices).

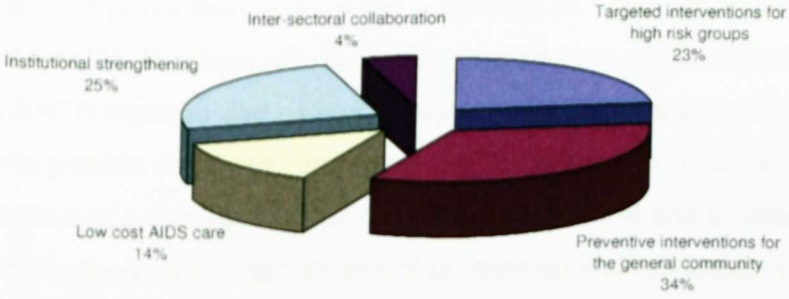
Funding source	*Initial outlay for 1999-2004 (millions INR)*	*Revised budget approved 2003 for 1999-2006 (millions INR)*	*Additional budget for 2004/05 & 2005/06 (millions INR)*
Government of India		1,960	
World Bank	11,550	9,591	
USAID (US Agency for International Development) - APAC project, Tamil Nadu		645.8	
USAID (US Agency for International Development) – AVERT project Maharashtra	1,660	1,660	
Department of International Development (UK)	1,040	4,870	
CIDA (Canadian International Development Assistance)		378.1	
AusAID (Australian Agency for International Development)		246.5	
United Nations Development Programme		64.7	
Global Fund for AIDS, Tuberculosis and Malaria			1,227.4
Total	14,250	19,419.1	20,646.5

Source: (National AIDS Control Organisation, 2000b; National AIDS Control Organisation, 2004a)

4.2.3. Priority targeted interventions

International evidence on the effectiveness and cost-effectiveness of HIV prevention programmes has led to the consensus that within lower prevalence settings targeted interventions for high-risk sub-populations should be a priority (World Bank, 1997). As a result the response to the HIV/AIDS epidemic in India includes these targeted interventions as one of the priority interventions in component 1 and they comprise over 23% of the total budget allocation (see Figure 4.1) (World Bank, 1997; World Bank Health Nutrition and Population Sector Unit. South Asia Region, 1999; National AIDS Control Organisation, 2000b; Jha, Nagelkerke et al., 2001). As a major component of the Indian response to the HIV epidemic, targeted interventions in India form the focus of this thesis.

Figure 4.1: **Budgetary allocations to National AIDS Control Programme, 1999**



Source: (National AIDS Control Organisation, 2000b)

Due to limited coverage of HIV prevention services by the public sector and NGOs' better ability to reach marginalised populations (Solomon, Chakraborty et al., 2004), the delivery of the targeted interventions is contracted out to NGOs. The targeted intervention projects themselves are shaped by guidelines provided by NACO including best practice documents, methods for high risk group identification, guidelines for NGO recruitment, budget allocation and monitoring and evaluation based on best practice interventions targeted at high-risk groups using a community based approach (National AIDS Control Organisation, 2000a; National AIDS Control Organisation, 2000b; Ramasundaram, Allaudin et al., 2001; Ramasundaram, 2002; YouandAIDS: the HIV/AIDS portal for South and North-East Asia, 2002b; Lenton, Hawkins et al., 2003). Training on the contracting for and implementation of targeted interventions for the SACS and NGOs has been built in to the NACP2 programme to support this process. The best practice model of intervention comprises HIV education, condom distribution and referral of cases of STIs for treatment for high risk groups (Jana, Bandyopadhyay et al., 1998; Jenkins, 2000; National AIDS Control Organisation, 2000a; National AIDS Control Organisation, 2001a). Also included is a component that recognises that facilitating behaviour change involves working to educate community influencers, e.g. providing HIV education to long term partners of sex workers and working with the

police to reduce harassment levels (National AIDS Control Organisation, 2000a; National AIDS Control Organisation, 2000b; National AIDS Control Organisation, 2004a).

4.2.4. Institutional arrangements

NACO works with the UN theme group on HIV/AIDS and bi-lateral donors and partners in various ministries to carry out the NACP2. This includes formulation of policy and implementation of prevention and control programmes. The SACS receive funds directly from NACO. Working with technical support from and in coordination with NACO, the SACS manage and deliver prevention and control at the state level. Bi-lateral donors provide support to individual SACS and are co-ordinated by NACO, to avoid duplication of activities. In addition to the government and bi-laterally supported efforts, there has been a strong movement of international foundations and local NGOs working independently to provide HIV prevention and care services[6].

As part of their activities, the SACS are responsible for the contracting out to NGOs of targeted interventions. In this way, NACO, through the SACS, aimed to train and finance over 600 NGOs to implement targeted interventions between 1999 and 2004 (National AIDS Control Organisation, 2000b). In fact, by July 2004 the various SACS held 933 contracts with NGOs to deliver HIV/AIDS activities (National AIDS Control Organisation, 2004a).

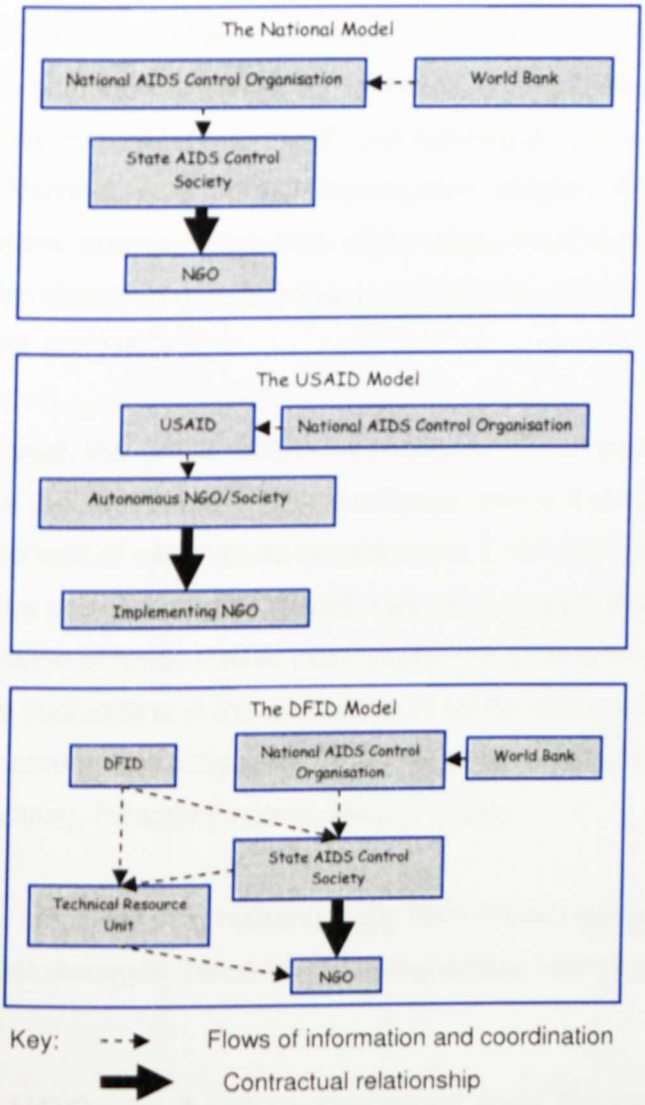
As a result of differing donor partnerships, different institutional arrangements have been developed for the management of NGO contracts at the state level. The three best established models are set out in Figure 4.2 . The national model corresponds with the NACP guidelines where SACS directly contract with the NGOs. An adaptation of this model operates in states whose HIV/AIDS activities are supported by the United Kingdom's Department for International Development (DFID): Andhra Pradesh, Gujarat, Kerala, and Orissa. In these four states the SACS contract with the NGOs and employ a technical support agency that manages the contracts and provides technical support to the NGO programme (the DFID model). Finally, the United States' Agency for International Development (USAID) supports an independent large NGO in Tamil Nadu and Maharashtra to contract directly with smaller implementing NGO partners, in coordination and with the approval of the local SACS and NACO (the

1.

[6] Major funders identified are: HIVOS (Humanist Institute for Development Cooperation); Bill and Melinda Gates Foundation; National Institute for Health (United States); HIV Alliance; MacArthur Foundation; and the Ford Foundation.

USAID model). Other institutional models are evolving as the remaining donors finalise agreements with NACO and move forward in their support of other state programmes.

Figure 4.2: Institutional arrangements in the 2nd National AIDS Control Programme for India



4.2.5. Financial flows

The state AIDS control societies were set up to provide for more flexible management of the AIDS control programme at the state level as well as to expedite the release of funds (Ramasundaram, Allaudin et al., 2001; YouandAIDS: the HIV/AIDS portal for South and North-East Asia, 2002a). When the first state AIDS society was established in Tamil Nadu, it was found that the distribution of funds direct to the SACS rather than through the state Ministry of Health led to the avoidance of many bureaucratic delays. In contrast to the AIDS programmes in other states, expenditure increased to meet its targets (Ramasundaram, Allaudin et al., 2001).

In theory, for all states, the budget of the SACS and their activities is based on annual plans submitted and negotiated with NACO. In reality, budget setting is only partially based on these plans. The World Bank releases funds to the Government of India, which distributes monies to the Ministry of Health in accordance with the annual plan. The Ministry of Health, in turn, releases funds to NACO which makes the budgetary allocations to the states. The funds distributed to NACO in any year are largely unpredictable as the actual allocation rarely meets the planned allocation. This arises from the government's commitment to the 9th and subsequently the 10th five year expenditure plans (National AIDS Control Organisation, 2004a). Along with an end of year surplus allocations, approximately 80% of the total annual budget is usually met. This persistent under-allocation of funds was one of the key reasons behind the extensions of NACP1 and NACP2.

During the financial year, the SACS receive three payments: an *ad hoc* amount of up to 50% of the budget at the start of the year; the balance, minus a small retention amount and based on a statement of expenditure is paid about 7 months later; and the final release is made at the end of the financial year based on budget availability. The *ad hoc* nature in the release of funds makes planning for the programme extremely difficult. Further, the fluctuations in the availability of funds lead to difficulties in the SACS meeting their contractual obligations in the latter part of the financial year (Personal communication, Director Finance, NACO. 2002).

In the USAID model, funds are channelled directly from USAID through the autonomous NGO that manages the contracts and provides technical support to the implementing NGOs.

4.3. *Survey of NGOs in Andhra Pradesh and Tamil Nadu*

4.3.1. Targeted HIV prevention activities in Tamil Nadu

4.3.1.1. State level funding of NGO targeted interventions

The Tamil Nadu NGO sector has been working on the issue of HIV/AIDS longer than any state. The first AIDS case was identified in Chennai in 1986 and a core group of NGOs took up both advocacy and programme activities in the late eighties through their existing links with key vulnerable groups. At the time of the study, Tamil Nadu had three government-supported targeted HIV prevention programmes running in parallel in which the funding agency contracts with NGOs:

Tamil Nadu State AIDS Control Society (TNSACS): this was the first of the SACS, established in 1996. TNSACS implements the state programme according to NACO guidelines and contracts directly with NGO partners to deliver targeted HIV prevention projects. It increased the number of NGOs contracted by the state programme from 17 in 1994-5 to over 100 in 1997/8 (Seshadri, 2003a). Having been documented as a model of best practice in terms of ability to spend and increasing the number of NGO contracts (Ramasundaram, Allaudin et al., 2001; Seshadri, 2003b), the TNSACS programme model was exported around the country.

Chennai Corporation AIDS Prevention and Control Society (CAPACS): this was established in 2001 and took over responsibility for all Chennai based activities of TNSACS. NGO contracting activities commenced in 2002, with the transfer of all Chennai based, TNSACS funded NGOs to the CAPACS programme. As with TNSACS, CAPACS implements the state programme according to NACO guidelines and contracts directly with NGO partners to deliver targeted HIV prevention projects. At the time of the fieldwork CAPACS was funding 8 targeted HIV prevention projects.

APAC (AIDS Prevention and Control): this is being implemented by Voluntary Health Services, a large NGO, with direct support from the United States Agency for International Development (USAID) and in coordination with the national and state AIDS programmes. It was established in 1996 with funding of USD 10 million for the period to March 2002. The programme has since been extended. As well as delivering prevention projects through 34 NGOs, at the time of the study, APAC has been responsible for implementing state-wide behavioural surveillance, a state-wide condom social marketing programme and providing capacity building in the form of training of trainers at 5 state institutions. The targeted HIV prevention projects follow a standard model of peer education as described in 4.2.3, combined with IEC (pamphlet distribution, puppet shows, films etc), training of health care providers and development of condom retailing network.

Total expenditures on these three state level programmes are shown in Table 4.2. Over the years 1999/2000 to 2001/02, APAC expenditures have exceeded the combined expenditures of the other two programmes. The low level of CAPACS expenditures reflects the start-up phase of this programme.

Table 4.2: Total expenditures (and budget allocation) for the Tamil Nadu state supported targeted HIV prevention programmes, INR millions, current prices.

	1999-2000		*2000-01*		*2001-02*		*2002-03**	
TNSACS	55.57	(46.98)	31.71	(47.88)	33.44	(31.30)	26.47	(51.14)
CAPACS	2.92	(12.5)	2.82	(10.15)	6.25**	(44.66)	n/a	n/a
APAC	55.00	(55.00)	90.87	(75.87)	43.30	(43.30)	n/a	n/a

Sources (Jayaraj, 2002), NACP & TNSACS expenditure reports

** funds released, n.a = not available

In addition to these major programmes, there are several NGOs in Tamil Nadu working at a state and even national level on HIV/AIDS, namely: YRG Care, HIV Alliance, Deepam Educational Society for Health, South Indian AIDS Action Programme and Christian Council for Rural Development and Research (CCOORR). HIV Alliance and YRG Care focus their work on care for people living with HIV/AIDS in Tamil Nadu and outside the state. YRG Care also has an extensive research programme. Deepam Educational Society for Health, funded by the Gates Foundation, provides HIV prevention activities as part of a reproductive health programme integrated into existing health and education services.

The South Indian AIDS Action Programme was established in 1992 to encourage existing NGOs (in South India) to integrate STD/HIV related issues into their programmes. Intervention programmes were initiated with trucking and sex worker communities with the support of Inter-Aide, a French support organisation. It also supported programmes in Karnataka and Andhra Pradesh. By 2000 South Indian Aids Action Programme had become focussed on the empowerment of these vulnerable groups rather than the primary activity of HIV prevention and the training of counsellors for voluntary counselling and testing for HIV and prevention of mother to child transmission of HIV for TNSACS.

CCOORR, an NGO hospital and health service provider, took up the provision of HIV prevention services by networking with other NGOs, as an extension of its existing work as a training institution for APAC. With funding from the Humanist Institute for Cooperation with Developing Countries, a Dutch NGO, they established a network of targeted HIV prevention projects in 2001.

Finally, since the completion of data collection, the Gates Foundation established the USD 200 million Avahan initiative in 2004, a nationwide HIV prevention programme for

high risk groups, which works in partnership with Voluntary Health Services in Tamil Nadu.

4.3.1.2. NGO targeted HIV prevention projects

A total of 133 organisations delivering 139 different HIV prevention projects were identified through the document review and interviews (see Table 4.3 and Table 4.4). Each of these NGOs was sent a questionnaire. 48 NGOs responded either in full or in part to the survey. The HIV prevention projects were funded by a number of different sources, both internal and external to the state. Table 4.3 describes the number of NGOs contracted to work on HIV prevention projects by the different funding agencies. Eighty-five NGOs received funding solely from TNSACS, 20 received funding from APAC and 7 from CAPACS. Eleven of the NGOs received funding from both TNSACS and APAC for HIV prevention projects for different target group populations. Table 4.4 shows the number of HIV prevention projects identified by funding agency and target population group. Sixty percent were funded by TNSACS and 22% by APAC. Other donors, including international funding agencies and foundations, accounted for 11.5% of the projects funded.

Table 4.3: Number of NGOs identified in Tamil Nadu as implementing targeted intervention prevention projects, their funding agencies and their response rate to the questionnaire*

	Number of NGOs	*Also funded by other** funding agencies for HIV prevention activities*	*Response rate*
APAC	20	3	45%
TNSACS	85	1	32%
CAPACS	7		0%
APAC and TNSACS or CAPACS	11	1	73%
Other**	9		44%
Number of NGOs	133		36%

*1 NGO may implement multiple HIV prevention projects; **Other includes Gates, Ford, MacArthur, Elton John, HIVOS, DFID, local donations, HIV Alliance, MISEREOR, CCOORR

Table 4.4: Number of HIV prevention projects identified in Tamil Nadu by major funder and population target group and response rate to the questionnaire*

	APAC	*TNSACS*	*CAPACS*	*Other***	*Total*	*% of total*	*Response rate*
Sex workers	6	19	3	1	29	20.9%	35.5%
Truckers	11	14	2	2	29	20.9%	46.7%
Factory/ Industrial/ Construction/ Agricultural workers		24		3	27	19.4%	44.4%
Migrant workers		12			12	8.6%	25.0%
Slum	8		1	1	10	7.2%	33.3%
Clients of sex workers (tourists, temple town interventions)	6			3	9	6.5%	50.0%
General population		2		4	6	4.3%	66.7%
Mixed group interventions		5			5	3.6%	100.0%
MSM/ Hijra		2	2		4	2.9%	50.0%
Tribals		4			4	2.9%	50.0%
Youth		1		2	3	2.2%	33.3%
Prisons		1			1	0.7%	0.0%
Total	31	84	8	16	139	100.0%	
% of total	(22.3%)	(60.4%)	(5.8%)	(11.5%)	(100.0%)		

* TNSACS projects may have different primary group to that stated in TNSACS list of sanctioned projects as in some cases the sanctioned title is only nominal and the NGO works with a vulnerable group in their locality that does not fit with TNSACS classification. One NGO may implement multiple HIV prevention projects: care projects and those for people living with HIV/AIDS have been excluded

**Other includes Gates, Ford, MacArthur, Elton John, HIVOS, DFID, local donations, HIV Alliance, MISEREOR, CCOORR

Classifying the targeted interventions by target group was more difficult than would be expected. In particular at TNSACS some NGOs were funded under the major classification of one vulnerable group when in reality they were working with broader populations or those that did not fit into the typology. For example one NGO was reported to be working with CSWs when in fact it was quite openly addressing the needs of the fishing communities. Many of the other responding NGOs also reported reaching a number of different target groups beyond the focus under their contract. This research has used the NGOs own classification of the primary target group.

The most common target populations identified were commercial sex workers and truckers (20.9 % of the total number of projects each). Workers defined by their occupation were the next most frequent target group (19.4%). TNSACS covered the broadest range of vulnerable groups within its NGO prevention projects (10 different population groupings) whereas APAC projects were focussed on four high risk

populations (commercial sex workers, truckers, clients of sex workers in tourist and temple town locations, and slum dwellers).

The difference in target population groups noted between the two major HIV prevention programmes (APAC and TNSACS) in Tamil Nadu derives in part from their different planning methods. Table 4.5 highlights some of these differences. APAC is reported to have taken a more top down approach to planning and contracted 1 NGO to deliver a project for 1 risk group. TNSACS planning has been led by the NGOs, addressing the NGO identified needs of the local population such that one NGO implements a project working with multiple groups according to the need identified by the NGO. In spite of the emphasis on NGO-led planning, TNSACS contracts are issued annually, with no guarantee that projects will continue each year. In contrast, APAC NGOs have a 3 year contract period.

Table 4.5: Characterisation of the APAC and TNSACS HIV prevention projects for vulnerable/ high-risk groups in Tamil Nadu

	APAC	*TNSACS*
Location	Urban	Rural
Planning methods	Top down; based on pre-identified themes; "white collar" approach	Bottom up, NGO led, needs based; grassroots approach
Costs	Costs are large	Costs are less
Target group coverage	Coverage: 1 NGO = 1 target group	Some NGOs maybe covering same group/ multiple groups; many different occupational groups
Contract timeframe	Time frame: 3 yrs/ NGO	1yr/ NGO (but changing)
Training & capacity building	Strong	Weak
Role of people living with HIV/AIDS (PLWHA) and care	Limited involvement of PLWHA	Greater involvement of PLWHA
Condom distribution	Social marketing	Free distribution (changing)
STI treatment	STD treatment – private sector training/referral	Integrated with project (drug costs included)

Source: Personal communication, NGO Adviser, NACO

Beyond the basic characterisation of the targeted HIV prevention projects presented here, it was possible to gather further information on the NGO characteristics and their history of working on HIV through the survey responses. There was a relatively low response rate (36%) in spite of follow up and frequent reminders made to the NGOs. As a result, the characteristics are only a partial description of NGOs working on HIV prevention in Tamil Nadu.

The major characteristics of the NGOs related to expenditure and experience are described in Table 4.6. There is a considerable mix. The age of the organisations ranged from 2 to 27 years. Experience working on HIV/AIDS ranged from 0 to 11 years. Of the NGOs responding to the survey, only 5 started out with HIV related activities as the focus of their work. The range in NGO expenditures and total staff numbers suggest that organisations of all sizes are working on targeted HIV prevention. The range of HIV-related staff and expenditures is far more limited. This possibly reflects the fact that the majority of HIV prevention projects are based on the NACO best practice model and therefore have fairly similar structures. Alternatively, the limited variation in expenditure may reflect the early stages of the response and the fact that projects have not yet had the time to establish themselves and increase coverage levels. It was also found that NGOs funded by APAC (n=16) were on average allocated three times the budget of TNSACS NGOs (n= 28) and HIV-related expenditures were 2.1 times greater.

Table 4.6: Total and HIV-related annual expenditures, total and HIV-related staff numbers, NGO age and HIV experience of NGOs responding to survey (N=48)

	Average	*Median*	*Max*	*Min*	*No response to question*
Organisation age, yrs	12.1	11	27	2	0
Total organisation annual expenditure, INR	4,816,794	1,115,149	44,194,174	181,675	6
Total no. of organisation staff	60	22	1,057	4	7
HIV experience yrs	5.21	5.00	11.00	0	0
HIV expenditures, INR	493,236	395,378	1,200,000	96,614	4
HIV–related no. of staff	10	10	24	3	7

The survey also requested information regarding the coverage of the intervention in terms of number of people reached in each of the population groups targeted. However, it was clear that this question was interpreted differently by each organisation. In addition, there were inconsistencies across sections of the surveys in the target groups reached. The validity and comparability of these data were therefore brought into question and not further analysed. An attempt to address this information gap and increase the data on HIV-related expenditures was made through accessing monthly and quarterly monitoring records at TNSACS. Unfortunately, the records were incomplete and it was not possible to get a picture of the annual coverage for each of the organisations. Data on many NGOs were missing for each month and a complete year's information was not available for the majority of the NGOs due to missing documents.

4.3.2. Targeted HIV prevention activities in Andhra Pradesh

4.3.2.1. State level funding of NGO targeted interventions

The state of Andhra Pradesh has been receiving support for its HIV prevention activities from a number of different sources since 1997. Prior to this, there was little HIV prevention work. The key actors in the support of HIV prevention work in this state were the UK Department for International Development and APSACS. In addition, some support had been provided by the NGO South Indian Aids Action Programme for encouraging NGO action, condom distribution and peer education among commercial sex workers. As of 2004, the Gates Foundation Avahan initiative is now also active in the state.

Support from DFID came in the form of two programmes: the Healthy Highways Programme – a national level programme employing NGOs to work with truckers and their sexual partners throughout the country; and the Partnership for Sexual Health programme – a state level initiative implemented by a State Management Agency (SMA) that was funded by DFID to contract NGOs to deliver HIV prevention interventions for high risk groups. In 2001, it was decided that all DFID bilateral support to the HIV/AIDS activities should be channelled through the SACS. The contracts for all the NGOs participating in DFID programmes were then transferred to APSACS to be managed alongside the APSACS-supported NGOs. The management of all NGO-SACS contracts was thus streamlined and then contracted out to one agency, the Technical Resource Unit (TRU) (see Figure 4.2, p. 104). The TRU has a managerial function as well as providing technical support to the targeted HIV prevention programme in the form of training, monitoring and evaluation and technical assistance. It reports directly to APSACS.

APSACS expenditures on targeted HIV prevention projects are reported in Table 4.7. However, information was not available on the expenditures of the early HHP and SMA DFID programmes. The increase in expenditures from 1999/2000 to 2000/01 therefore reflects the expansion of the APSACS programme and the initial recruitment of NGO projects. The almost negligible expenditure in 2001/02 is a reflection of the re-organisation of the NGO contracts and the merging with the DFID programmes.

Table 4.7: Total expenditures and budget allocation for the Andhra Pradesh state supported targeted HIV prevention programmes, INR millions, current prices.

	1999-2000	*2000-01*	*2001-02*	*2002-03*
Expenditure	15.55	49.82	1.23	34.62*
Budgetary allocation	40.42	37.4	2.6	151.76

Sources: (Technical Resource Unit, 2003); NACP & APSACS expenditure reports
* funds released; n.a = not available

4.3.2.2. NGO targeted HIV prevention projects

The survey in Andhra Pradesh covered only those projects supported by APSACS. At the time of the study APSACS held 101 NGO contracts, all delivering a single project for APSACS, except for one NGO which had the responsibility for two projects. The NGOs were recruited under the different programmes in different phases so that they can be grouped according to the agency that recruited them and the batch in which they were recruited. Table 4.8 provides the breakdown of projects by recruitment agency, batch of recruitment and target group. Seven Healthy Highways projects were the first projects to be implemented in the state through bi-lateral funding, starting in 1997. The State Management Agency then recruited 16 NGOs to implement projects for commercial sex workers, street children and slum dwellers in early 1999. These vulnerable groups had been identified through a behavioural surveillance survey conducted with support of DFID (TNS Mode, 1998; TNS Mode, 2001b; TNS Mode, 2001a). This programme was scaled up with the recruitment of a further 20 NGOs and the addition of two further risk groups to the programme (transgenders and men who have sex with men) in December 2000. APSACS began recruitment of NGOs for the targeted HIV prevention projects in mid 2000. They recruited 2 batches of NGOs to implement truckers and slum dweller projects, before the merging of the NGO project management in 2001. By the time of the merger, 101 NGOs were under contract to the different agencies for delivery of targeted HIV prevention projects. Nearly half of these (45.5%) were slum dweller projects, 23.8% were trucker projects and 19.8% were commercial sex worker projects (see Table 4.8).

Table 4.8: Number of HIV prevention projects funded by APSACS by agency and batch of recruitment and target group.

Funding agency at recruitment to programme	*DFID's State Management Agency*		*DFID's Healthy Highway Programme*	*APSACS*		*Total*	*% of total*
	*Batch 1**	*Batch 2^*		*Batch 1***	*Batch 2^^*		
Commercial sex workers	9	11				20	19.8%
Truckers			7	7	10	24	23.8%
Slum dwellers	4	1		20	21	46	45.5%
Transgenders		2				2	2.0%
MSM		2				2	2.0%
Street children	3	4				7	6.9%
Total	16 (15.8%)	20 (19.8%)	7 (6.9%)	27 (26.7%)	31 (30.7%)	101	100.0%

* Start date of HIV prevention project - February 1999; ^ start date of HIV prevention project - December 2000; start date of HIV prevention project - June 1997; ** start date of HIV prevention project - July 2000; ^^ start date of HIV prevention project October 2000

Further characterisation of the NGOs could only be achieved through the simplified survey sent out to the NGOs (see sections 3.4.2.2 and **Error! Reference source not found.**). As with Tamil Nadu there is a considerable mix in the size and experience of NGOs working with APSACS. Table 4.9 shows that the organisations range from 3 to over 80 years of age and have total annual expenditures ranging from INR 150 thousand to INR 150 million. The range of HIV experience is also mixed.

Table 4.9: Total annual expenditures, total and staff numbers, NGO age and HIV experience of NGOs responding to survey (N=82)

	Average	*Median*	*Max*	*Min*	*Missing*
Organisation age, years	15.6	14.6	80.1	2.9	19
Total organisation annual expenditure, INR	6,922,646	1,935,005	150,000,000	150,000	22
Full time staff (all organisation)	62.1	28.0	550.0	8.0	20
HIV experience, years	6.0	5.0	14.6	3.1	20

4.3.3. Quality and availability of the information for the production cost analysis

4.3.3.1. Activity and input documentation

From project visits it was determined that the APAC and APSACS project activities had been documented and records of inputs such as condoms, IEC materials and STD drugs were well kept and available. For the projects funded by TNSACS the quality of this reporting varied. On several occasions the research team were told that the

monitoring of TNSACS projects was poor due to the lack of training provided and the inadequacy of evaluation visits. There was a clear difference in documentation between those NGOs with a history of working with a large international funding agency records and those that did not. Records were better kept and easier to identify in the former. However, the latter organisations were smaller in size so that capturing the information through interviews with long-standing staff members was thought to be possible.

4.3.3.2. Routine monitoring

All interventions across the states and the different funding programmes are required to submit monthly monitoring reports. Data from the questionnaire indicated that there are two forms of internal monitoring: first, through discussion of activities and lessons learned and, second, through production of indicators according to a framework set down by the funding agency. In Tamil Nadu, for APAC, TNSACS and CAPACS, monitoring reports are submitted on a monthly basis. These reports included information on both coverage and activities. In addition, for TNSACS and CAPACS, a Joint Appraisal and Review Team (JART) make twice yearly evaluation visits to the TNSACS NGOs and submitted reports to the TNSACS. CAPACS follows the same system of management. APAC has a similar external evaluation mechanism to ensure quality of service provision. In Andhra Pradesh, interviews with the TRU and NGO visits revealed that careful monitoring records, including monthly records on coverage and activities, were being kept. Monitoring is seen as an integral part of the project and the importance placed on this activity suggested that the data observed were of reasonable quality.

4.3.3.3. Financial data

Although financial statements do not necessarily reflect the cost structure of the intervention as a result of variations in reporting requirements and donations in-kind, they do provide a guide to expenditures and require documentation of prices and inputs for which there is a financial transaction. All NGOs are required to submit quarterly financial statements to funding agencies. Across the board annual audited statements are compiled for each intervention and for the organisation as a whole. For all the SACS and APAC these statements need to be supported by vouchers providing records on expenditures on project inputs.

4.4. Summary of findings

This chapter has presented the results of a situational analysis of targeted HIV prevention programmes in Southern India, conducted to identify the sampling frame and assess the feasibility of the production cost analysis of scaling up. The analysis found that the 2nd phase of the National AIDS Control Programme was designed to fit with the early stage of the epidemic and allocated 23% of the total budget to targeted interventions. A comparison of the state level response in two of the high prevalence states also found:

- A number of different funding sources for NGOs working on HIV prevention for high-risk groups including international and national NGOs, bi-lateral donors and state funding
- Variation in the institutional arrangements and mechanisms for contracting NGOs across the different funding sources and state AIDS control societies
- Variation in the methods of planning the delivery of NGO projects across the different funding sources

In spite of lack of access to the USAID supported APAC programme, the mapping survey found that the remaining HIV prevention programmes could provide both a sufficient sample of projects for the analysis and an important difference in institutional arrangements for comparative analysis of the transaction costs.

The available NGO HIV prevention projects for the sample in Tamil Nadu were funded by TNSACS, CAPACS and a group of non-governmental donors in Tamil Nadu. In Andhra Pradesh, the HIV prevention projects identified to make up the sampling frame were supported by APSACS alone. The NGOs supported by these funding agencies represented a mix in terms of size and experience. However, the sampling frames across the two states comprised similar characteristics. Organisation expenditure and staff, organisation age and HIV experience fall in similar ranges (see Table 4.6 and Table 4.9)

A further important finding of the survey was that, in spite of missing coverage and output information in the questionnaire responses, centralised monitoring systems require reporting that allow comparing NGO projects by level of output. Monitoring systems and standard NGO records are therefore likely to yield sufficient information for full economic costing of a sample of case study NGOs.

The next three chapters present the analyses and results of the cost analyses of HIV prevention services delivered by contracting out to NGOs and identified through this situational analysis. Using an accounting approach, Chapter 5 starts with an analysis of the production costs of a set of 19 case study HIV prevention projects.

Chapter 5. Cost analysis of HIV prevention services for vulnerable groups in Southern India

5.1. Introduction

As a starting point to understanding the costs of the HIV prevention activities identified in the mapping analysis, this chapter uses the case study NGO projects to explore the production costs. The chapter's objective is to describe how costs of HIV prevention projects change with coverage level. This is achieved in the following steps:

- calculating the total costs, average costs and cost profiles of 19 case study NGO HIV prevention projects in two states in Southern India
- exploring how uncertainty in the data affects the cost estimates
- identifying and explaining the causes of average cost variations with particular focus on project scale using quantitative and qualitative analysis
- testing the sensitivity of the relationships between costs and scale to uncertainty in the data

In describing these steps, the chapter first sets out the background and rationale to the analysis of costs of HIV prevention interventions before providing a brief overview of the methods used to do so. Next, it presents the case studies analysed, including their costs and scale. The following section analyses the causes of variation in the total costs, scale and average costs of the HIV prevention projects. The results and their limitations are discussed in the penultimate section. Finally conclusions regarding the causes of cost variation are drawn and presented. A version of this chapter was published in the October 2005 issue of the Bulletin of the World Health Organisation (see Appendix 10) (Guinness, Kumaranayake et al., 2005).

5.2. Background

Comparing costs of a particular health service intervention across different sites can provide insights into operating efficiency and a better understanding of cost profiles in order to ensure efficient use of resources in the process of scaling up. Examples of such analyses in the public health literature include Creese, Sriyabbaya et al., 1982; Robertson, Davis et al., 1984; Over, 1986; Gilson, 1992; Robertson, Hall et al., 1992; and Mansley, Dunet et al., 2002. Few cost analyses of HIV prevention interventions exist (Kumaranayake and Watts, 2000c; Creese, Floyd et al., 2002; Scotland, Van Teijlingen et al., 2003; Walker, 2003). The cost analyses presented in these reviews look at one project in one setting at a single point in time. Two exceptions are a cost

analysis of condom social marketing that notes how programme maturity reduces average costs (Stallworthy and Meekers, 1998) and an analysis of costs and efficiency of voluntary counselling and testing services in Andhra Pradesh, India (Dandona, Sisodia et al., 2005b). Potential differences in costs and efficiency likely to arise with different locations, time periods and scale of operation, have therefore only been addressed to a limited extent in the HIV/AIDS literature.

By analysing the costs of 19 case study targeted HIV prevention projects in Southern India, this chapter begins to address this information gap. These NGO projects all form part of the National AIDS Control Programme's (NACP) efforts to scale up targeted interventions by replicating best practice HIV prevention projects targeted at high-risk groups (National AIDS Control Organisation, 2000a; National AIDS Control Organisation, 2000b; Ramasundaram, Allaudin et al., 2001; Ramasundaram, 2002). The guidelines on best practice prescribe the key components of the targeted HIV prevention projects: HIV education, condom distribution and referral of STI cases for treatment for high risk groups (Jana, Bandyopadhyay et al., 1998; Jenkins, 2000; National AIDS Control Organisation, 2000a; National AIDS Control Organisation, 2000b). Also included is a component that recognises that facilitating behaviour change involves working to educate those groups or individuals that may influence the target community, e.g. providing HIV education to long term partners of sex workers and working with the police to reduce harassment levels (National AIDS Control Organisation, 2000a; National AIDS Control Organisation, 2000b). In addition, the National AIDS Control Organisation (NACO) guidelines recommend budget structures and budget levels, set according to an estimated constant average cost per person reached (National AIDS Control Organisation and UNAIDS, 2001). With these guidelines, NACO in partnership with the State AIDS Societies (SACS) have rolled out over 900 NGO targeted HIV prevention projects throughout India (National AIDS Control Organisation, 2004a). Due to the use of guidelines, the structure of the projects and therefore their production functions, including the ratio of variable to fixed costs, is likely to be fairly uniform across the country. Collecting detailed cost data from a sample of these projects, it is possible to explore how and why costs might vary despite these budgetary guidelines and similar production processes.

5.3. Statement of hypotheses

Accounting cost studies have frequently found variation in average costs across sites, in spite of looking at the same health service interventions using the same methodologies (Creese, Sriyabbaya et al., 1982; Robertson, Davis et al., 1984; Over, 1986; Gilson, 1992; Robertson, Hall et al., 1992; Creese and Parker, 1994; Stallworthy

and Meekers, 1998; Grieve, Dundas et al., 2001; Mansley, Dunet et al., 2002; Hutton, Fox-Rushby et al., 2004). Economic theory and evidence describe a number of key dimensions related to the production technology, scope, wastage, input prices, context, timeframe and scale of operation that will cause this variation. Another aspect not identified as explored in the health services literature is the influence of different financing mechanisms (for example: payments are made in full prospectively or retrospectively or whether all or some of the payment is linked to performance) on costs.

The hypothesis for the following analysis is that scale is a leading factor influencing the average cost of the HIV prevention projects. In theory, as discussed in Chapter 2, as output increases the average cost first falls and then rises. The falling average cost in the short run is a manifestation of fixed costs spread over an increasing number of units of output. The same phenomenon is illustrated by a changing rate of increase in total costs and increases in the ratio of variable to total costs as scale increases.

A variety of different output measures collected as part of routine HIV prevention project monitoring can be said to represent scale of operation at the NGO project level: number of people reached, STIs referred, STIs treated (where relevant), number of condoms distributed, number of 1st contacts with the target group, total number of contacts with the target group and total number of contacts with the community (see Chapter 3). Number of people reached reflects scale of the HIV prevention project as indicated by national policy which aims to increase coverage in order to achieve behaviour change among increasing numbers of the population. The remaining 6 indicators reflect different aspects of scale in terms of the volume of services provided by the projects. To ensure clarity in this analysis, the number of people reached is referred to as "coverage" and the remaining indicators of scale as descriptors of "volume". In theory, coverage and volume should be related i.e. as coverage increases so should the volume of services provided. However, projects with the same coverage may provide different volumes of services. For example, a project reaching 1000 CSWs may treat 0.5 STIs per CSW reached in one area. In an area with lower STI prevalences, a project reaching the same number of CSWs may only treat 0.2 STIs per CSW reached. For planning purposes, if objectives are set according to coverage, knowledge regarding the relationship between volume and coverage is an important factor in determining resource requirements.

At the programme (or funding agency) level a similar distinction can be made between coverage (number of people reached or number of NGOs contracted) and volume (e.g.

number of training programmes provided, number of monitoring visits made, number of educational materials produced) indicators of scale. This chapter focuses on the NGO project as the unit of analysis and examines how the different dimensions identified in the literature (see first paragraph of this section and section 2.7.1.3) influence the differences between the average costs of the NGO projects.

Aside from scale and input prices, proxy variables are required to measure the different dimensions that theory predicts will affect average costs. Differences in production technology were identified during data collection and the projects grouped accordingly. Differences in context, at the state level, are captured in a comparison of the NGOs across the two states. The district level literacy rate, taken from the All India Census 2001, is used as an indicator to also represent contextual variations as well as population differences at the district level (Census of India, 2001). The funding agency and the actual project budget are used as variables to reflect differences in financing mechanisms. Programme maturity is defined by the number of years the NGO has been working on the HIV prevention project. Given its multi-dimensional nature and associated measurement difficulties (Lafond, Brown et al., 2002), capacity is measured using four indicators: holding of an FCRA certificate[7]; size of the organisation, as defined by total annual expenditure and percentage of staff working on HIV; funding agency; and the funding batch, defined by the agency that made the original contract with the NGO to implement the targeted HIV prevention project (see Table 5.1). The hypotheses for the direction and strength of the relationships between these dimensions and average costs are stated in Table 5.1.

1.

[7] An FCRA (Foreign Contribution Regulation Act) Certificate allows an NGO or individual to receive funds for services. Without this they are only able to receive donations from Indian national individuals and organisations. An NGO has to meet certain criteria to obtain this certificate.

Table 5.1: Variables hypothesised to influence average costs of the HIV prevention projects

Dimension	*Variable*	*Hypothesised relationship with average cost*	*Sample (only CSW projects unless otherwise stated)*
Scale	Number of people reached by the project STIs referred STIs treated Condoms distributed 1st contacts made with the target group (TG) All contacts with the TG All contacts made with the local community	+ve or –ve: average costs first fall and then rise as scale increases	17 CSW NGO projects
Production technology	(i) Provision of STI services	Increase in total costs due to additional physical & human resources and unpredictably of drug costs Increase in coverage and volume due to improved access to services	2 NGOs provide own STI services; 15 NGOs refer patients elsewhere
	(ii) Target group	Unknown	17 CSW projects; 2 truckers' projects
Context	(i) Literacy of local population	-ve: as literacy levels rise, the ease of accessing populations with health education messages improves, lowering total costs and increasing population coverage.	17 CSW NGO projects
	(ii) State	Unknown	9 CSW projects in AP; 8 CSW projects in Tamil Nadu
Financing	(i) HIV project budget	+ve: Over-budgeting may lead to inefficiencies and higher average costs. Under-budgeting may result in inefficiencies and higher average costs. -ve: Smaller budgets can lead to improvements in efficiency and lower average costs.	17 CSW NGO projects
	(ii) Funding agency	Average cost higher if funder uses agency for management and technical support; Average costs lower with better quality support & greater numbers of NGOs	7 APSACS; 2 CAPACS; 2 CCOORR; and 4 TNSACS projects
Programme maturity	Years working on HIV prevention project	-ve: learning by doing/ increased service uptake lead to lower average costs	17 CSW NGO projects

Table 5.1 (Cont.): Variables hypothesised to influence average costs of the HIV prevention projects

Dimension	*Variable*	*Hypothesised relationship with average cost*	*Sample (only CSW projects unless otherwise stated)*
Capacity	NGO size: (i) Annual expenditure of NGO (ii) Percentage of all staff working on HIV	-ve: larger organisations have greater capacity and experience leading to improved efficiency +ve: larger organisations are unwieldy and are over-extended leading to inefficiencies and higher average costs	17 CSW NGO projects
	Funding agency	Average cost higher if contractual agency intermediary: Average costs lower with better quality support & greater numbers of NGOs	Current funding agency: 7 APSACS: 2 CAPACS: 2 CCOORR; and 4 TNSACS projects
	Funding batch (Andhra Pradesh only)	Average costs lower if better quality support or greater numbers of NGOs	Funding batch: 6 SMA 1st round: 2 SMA 2nd round: 1 RMU: 1 APSACS: 2 CAPACS: 2 CCOORR: and 4 TNSACS projects
	Holder of FCRA (Foreign Contribution Regulation Act) certificate	-ve: organisations with FCRA certificate have greater capacity and experience and are more efficient	17 CSW NGO projects
Input prices	Average salary of ORW Average income of PD Average salary of PM Average salary of administrative staff Average income earned by PE	+ve: Lowering average costs might be achieved by securing lower input prices	17 CSW NGO projects
Wastage	Not measured	Increase in average costs with higher levels of wastage	n/a

Note: STI = sexually transmitted infection; APSACS = Andhra Pradesh State AIDS Control Society; TG = target group; +ve = positive; -ve= negative; ORW = outreach worker, PD = project director; PM = project manager; PE = peer educator; n/a = not applicable; FCRA = Holder of Foreign Contribution Regulation Act certificate; CSW=commercial sex worker; TNSACS=Tamil Nadu State AIDS Control Society; CAPACS=Chennai Corporation AIDS Prevention and Control Society; CCOORR=Christian Council for for Rural Development & Research; SMA = state management agency (former agency responsible for managing DFID funded CSW, street children and slum projects); RMU = regional management unit (former agency responsible for managing the DFID supported healthy highways/ truckers' projects in Southern India.

5.4. Methods

5.4.1. Data collection and cost calculation

Economic cost data were collected from 17 commercial sex worker projects funded by 4 different agencies in the states of Tamil Nadu (TN) (Tamil Nadu State AIDS Control Society (TNSACS), Chennai Corporation AIDS Prevention and Control Society (CAPACS) and Christian Council for Rural Development and Research (CCOORR)) and Andhra Pradesh (AP) (Andhra Pradesh State AIDS Control Society (APSACS)), see Table 5.3. In addition two truckers' projects in Andhra Pradesh were included in the analysis to incorporate the range of historical differences in funding agencies[8] and the impact of resulting contractual experience on costs in the analysis. Total costs were then calcualated for each NGO project. Scale was measured using the different indicators of coverage and volume as described in Table 5.1 and defined in Chapter 3. Average costs were calculated for each of these scale variables by dividing the total cost by the scale measure.

5.4.2. Limitations in the data

Due to the retrospective nature of the data collection, several constraints were faced in obtaining full information required for the cost analysis relating to missing data, inaccuracies in the data and where price measures had to be used in place of cost.

Inaccuracies in the data are related to: first, the usual flaws and mis-reporting to which all routine monitoring systems are subject, including missing values for coverage (1 NGO) and volume (2 NGOs) indicators; second, the values obtained for peer educators' time and income are constrained by the limited numbers available for interview, drunkenness or false replies; third, there was a tendency for project directors to under-estimate incomes or, where the research team were perceived as evaluators, a tendency to over-report time spent on the project; fourth, STI treatment records were not available at all sites; and finally, systematic records on quantities of educational materials, training sessions and condom revenues were not available.

1. _____

[8] Until June 2002, AP had 3 different agencies managing and funding targeted interventions at the state level – APSACS, the DFID funded state management agency and the DFID funded regional management unit of the Health Highways Programme. The management of these was merged in 2002 and all state level funded targeted HIV prevention projects are managed by a technical resource unit contracted by APSACS (see Chapter 4).

The assumptions used to minimise these limitations are described in Chapter 3. In the case that quantities of inputs were not available, e.g. building space, transport and community meetings, prices have been used to represent costs. These data might be a better reflection of the budget than the resources used, as expenditures tend to be budget driven. Importantly, this limits the ability of the analysis to examine the relationship between the production and cost function for these particular items.

5.4.3. Addressing uncertainty in the data

Ranges for total costs and the ratio of variable to total costs were generated to account for data limitations related to missing data and data inaccuracies in the input and price data described above. Table 5.2 presents the assumptions made to generate these ranges. To obtain an estimate of the types and quantities of materials and training sessions, a combination of the author's understanding of projects, available records and interviews with funding agency staff or contractors were used. A standardised quantity and cost for training and educational materials that would be expected for each NGO was then generated for each funding agency. To obtain an alternative estimate for the cost of condoms sold by the organisation, it was assumed no revenue from condoms was received by the service providers. In the case of personnel and peer educators the input and price values were varied according to the range of responses received in the full NGO sample.

To generate ranges in the average cost we first used a one way analysis dealing with the uncertainties in the cost data. Where coverage data were missing, the target population set down in the contractual document was used as a proxy. Where volume indicators are missing, no proxies were identified so these were left as missing values. One- and two-way sensitivity analyses were then used to account for the limitations of the coverage data. Coverage variables were varied by 10% above and below the initial level.

Table 5.2: Assumptions accounting for uncertainty arising from the data limitations

Input	*Baseline assumption*	*Problem*	*Value(s) used in sensitivity analysis*	*Source*
No. of training sessions	Number of sessions based on NGO data	Data incomplete at many NGOs	Funding agency specific standardised quantity and cost	Funding agency accounts
Educational materials	Materials on site or recorded as distributed, based on observational tour, interviews and records of distribution	Data incomplete at many NGOs; materials worn out or not available.	Funding agency specific standardised quantity and cost	Designer and supplier of educational materials
Condoms sold	Revenue from condoms = cost of condoms purchased by NGO	No records available; many NGOs not selling condoms that are procured for sales	No revenue from condom sales	-
Personnel (project director)	Project director's own estimation of average income	Inaccuracies in self-reported data and missing data	Interquartile range of value of PD income	Sample of PD's reporting income
Peer educators	At each NGO: (median value of time) x (median time spent on project activities) based on interviews with peer educators	Inaccuracies in self-reported data and missing data	Min and max values of time cost	Sample and average income per capita for low income groups (National Council of Applied Economic Research, 2001)

5.4.4. Analysing the relationship between coverage and volume

A Spearman's rank order correlation coefficient test was used to determine if there is a relationship between coverage and volume, with a null hypothesis of no relationship between the two variables. Number of people reached was used in comparisons of CSW projects. However, in comparing projects working with different target groups, this indicator is likely to be invalid due to the different nature of "reach" – a CSW project requires a long term relationship with each member of the target community whereas in the trucker community, one-off as opposed to repeat contacts are necessary as the individual moves on from truck stop to truck stop. Comparisons of volume for the different groups, on the other hand, are valid for across-target group comparisons as they relate to the same activities.

5.4.5. Analysis of variation

Scale, total and average costs (with respect to each scale variable) were compared across the projects. In addition, comparisons of cost profiles provide a description of the differing patterns of resource use. Due to the small sample sizes non-parametric methods were used to look at the relationship between scale and the three cost variables: total costs, cost profile and average costs. The same relationships between the cost variables and scale were then explored using scatter plots. Then, to identify whether these are non-linear relationships, the cost variables were regressed on scale, first using a linear form equation and then comparing it with the quadratic form.

Further analysis was then carried out to look at whether the scale, total costs, average costs and cost structure are affected by the dimensions described in Section 5.3 and Table 5.1, namely capacity, context, prices, programme maturity, financing mechanisms, production technology and wastage.

The relationships between the dimensions of capacity, context, prices, programme maturity and financing mechanisms (Table 5.1) and the cost variables were tested using non-parametric methods. Two tests were used to explore the impact of the seven dimensions: the median test for categorical explanatory variables and Spearman's rank order correlation coefficient test for independence of samples for the continuous explanatory variables (see for example (Pett, 1997)). The null hypothesis for each test was that there is no relationship between the scale or cost variables and the explanatory variable.

In the case of production technology, which varies due to the different methods for STI management and the different target groups, the numbers of CSW NGOs with STI clinics (3) and the number of truckers' projects (2) were too small to allow statistical tests of the relationship between production technology and costs. Cost variations were therefore explored through visual inspection of the data.

In looking at the impact of prices on costs, unit prices of personnel and peer educators were compared with average costs using the average project cost of an outreach worker and a peer educator at each project (total cost divided by number of people). There is no variation in the prices of educational materials, condoms and STI drugs. The price of training varies only at the funding agency level, so the impact of any differences will be picked up in inter-agency comparisons. For other inputs, quantities were not known and therefore price differentials cannot be discerned.

It was not possible to capture wastage in quantifiable form so observation, interviews and documentation of these factors served to enrich the quantitative analyses.

5.4.6. Sensitivity analysis

Sensitivity of the results to the assumptions made in addressing data limitations in section 5.4.2 was tested in a further sensitivity analysis. The non-parametric tests and regressions were re-run to explore if the relationships still hold using the extreme values of total cost, ratio of variable to total costs and average cost.

5.5. Results: the costs of HIV prevention projects

5.5.1. Description of the HIV prevention projects

The seventeen CSW projects are characterised in Table 5.3. Eight of the CSW projects are from Tamil Nadu and 9 are from Andhra Pradesh, where the two truckers' projects are located. As can be seen from Table 5.3, there is a wide range in coverage achieved by the CSW projects (250 to 2008 CSWs reached) as well as variation in the HIV prevention budgets and activities in the form of methods chosen for managing STI treatment. HIV prevention budgets range from INR 204,000 to INR 1.1 million and two out of the 17 projects run their own clinic for provision of these services, whereas the remainder refer potential patients to local health care providers. The NGOs themselves vary in terms of overall levels of annual expenditure (INR 225,000 to 46 million) and HIV experience (3 – 13 years). In addition, 14 of the 17 NGOs have sufficient capacity to have obtained a government certificate which permits the organisation to receive foreign funds i.e. they have been in operation for a set period of time and have submitted accounts of sufficient quality to the government.

As a result of problems in the selection procedures (see chapter 4), there were some differences in the characteristics of the case study NGOs from those in the overall sampling frame described in chapter 4. In the case of TNSACS, the characteristics of the NGOs included in the case study had on average lower overall expenditures and staff numbers but more experience than those that made up the sampling frame (see Table 4.6 and Table 5.3). In the case of APSACS, the case study NGOs had on average lower overall expenditures and numbers of staff, were older but had less HIV experience than the sampling frame average (see Table 4.9 and Table 5.3).

Table 5.3: Characterisation of the sample of case study HIV prevention projects for commercial sex workers by funding agency

Characteristic	*Descriptive statistics, median (range) – where relevant*					*Variable name*
Funding agency	APSACS**	TNSACS^	CAPACS^^	CCOORR~	Total	Financing variable 2
Sampling criteria	Reputation, location & experience	Convenience (i.e. subject to availability & accessibility)	All	Reputation, location & experience		
Number of CSW* projects funded	21	13	2	4	40	
No. of projects selected	9	4	2	2	17	
Coverage	1613 (935 – 2008)	967 (600-1,749)	700 (550-850)	281 (250-311)	1047 (250-2008)	Coverage
NGO run STI clinic (numbers)	0	1	1	0	2	Production technology
HIV annual budget, 000s INR	700 (652-1,144)	298 (204-435)	334 (274-393)	missing	652 (204-1,144)	Financing variable 1
Funding batch	6 SMA 1st batch; 3 SMA 2nd batch	4 TNSACS	2 CAPACS	2 CCOORR	Not applicable	Financing variable 3
HIV experience	5 (3-13)	6.5 (4-11)	9 (6-12)	5.5 (5-6)	5.5 (3-13)	Capacity variable 1
Organisation total annual expenditure, 000s INR	1,922 (225-9,717)	8,257 (784 – 45,784)	2,281 (700-3,862)	missing	2,171 (225 – 45,784)	Capacity variable 2
Number of staff in NGO	23 (10-134)	43 (8-176)	32 (14-49)	47 (10-83)	27 (8-477	Capacity variable 3
Number of NGOs with FCRA certificate permitting receipt of foreign funds	8	4	1	1	14	Capacity variable 4
State	Andhra Pradesh	<---------- Tamil Nadu ---------- >				Context variable 1
District literacy rate, % of population[1]	69 (59-73)	82 (76-85)	73 No variation	78.5 (78-79)	73 (59-85)	Context variable 2
Age of NGO, years	18 (5-21)	19 (6-29)	22 (6-38)	13 (7-19)	18 (5-38)	

*CSW=commercial sex worker; **APSACS= Andhra Pradesh State AIDS Control Society; ^TNSACS=Tamil Nadu State AIDS Control Society; ^^CAPACS=Chennai Corporation AIDS Prevention and Control Society; ~CCOORR=Christian Council for for Rural Development & Research.[1] Source: (Census of India, 2001)

Despite the prescribed structure of the targeted interventions (TIs) in India, there is also variation in the production technology or structure of services across the target groups: the methods with which it is best to reach marginalised communities such as commercial sex workers (CSWs) or injecting drug users will be different to those for reaching migrant workers, truckers or men who have sex with men (MSM). In addition, service delivery methods were found to vary within the sample of CSW projects in the case studies. Two different approaches to STI management were used: the provision of STI services or referral for treatment at partner health care providers. 1 TNSACS NGO project and 1 CAPACS NGO project as well as one trucker's project in Andhra Pradesh incorporate an STI clinic into their activities.

Input price variation is evident in both the values of staff and peer educator time (see Table 5.4). The range of costs for the 4 staff categories is from 134% to 184% of the median value. For all categories except administrative staff, CCOORR has the lowest prices. CAPACS has the highest prices for 2 out of 3 staff categories (project director and outreach staff). For peer educators, the range of prices is over 300% of the median value. There is no statistically significant difference in the prices across states or funding agency except in the case of outreach workers across the funding agencies (see Table 5.4).

Table 5.4: Price differentials across personnel^ and peer educators^^ between state and funding agencies, INR (Chi squared test with null hypothesis that there is no difference in prices).

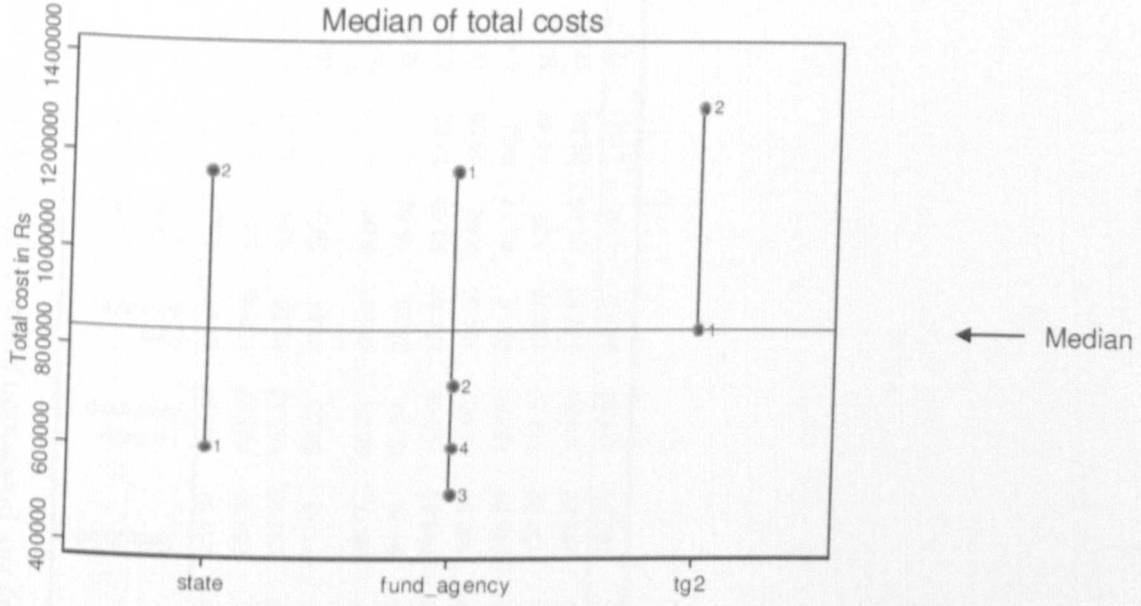
	N		All	State		Funding agency			
				Tamil Nadu (n=8)	Andhra Pradesh (n=11)	CAPACS (n=2)	CCOORR (n=2)	TNSACS (n=4)	APSACS (n=9)
Project Director	17	Median	9000	8667	11250	6067	8567	10000	11250
		Range	(3,467 - 20,000)	(8,067 - 12,000)	(9,000 - 13,714)	(3,467 - 8,667)	(8,133 - 9,000)	(8,000 - 12,000)	(7,705 - 20,000)
		χ^2		0.3825		5.578			
Project Manager	17	Median	6191	7243	5000	6727	7310	6191	5000
		Range	(2,500 - 10,400)	(6,191 - 9,000)	(3,650 - 6,841)	(6,191 - 7,264)	(7,243 - 7,377)	(3,763 - 9,000)	(2,500 - 10,400)
		χ^2		1.9438		5.130			
Outreach worker	17	Median	3286	3278	2889	3586	3013	2981	2889
		Range	(1,196 - 5,773)	(2,837 - 3,744)	(2,202 - 3,621)	(3,428 - 3,744)	(2,693 - 3,334)	(2,571 - 3,278)	(1,196 - 5,773)
		χ^2		1.440		8.790*			
Administrative staff	17	Median	2476	2635	2150	2863	2723	2635	2150
		Range	(1,787 - 5,180)	(2,557 - 3,249)	(1,951 - 2,926)	(2,476 - 3,249)	(2,536 - 2,911)	(2,578 - 2,730)	(1,787 - 5,180)
		χ^2		0		4.091			
Peer educators	17	Median	2800	3191	2,800	2863	2723	2635	2150
		Range	(200 - 9,000)	(2,325 – 4,625)	(2,430 – 4,375)	(200 - 5,000)	(1,500 - 2,600)	(2,741 - 9,000)	(1,750 - 5,000)
		χ^2		0.0726		5.053			

Note: ^price = gross salary per month; ^^ price = estimated value of peer educator time spent on project evaluated from peer educator interviews; *significant at the 5% level; APSACS= Andhra Pradesh State AIDS Control Society; TNSACS=Tamil Nadu State AIDS Control Society; CAPACS=Chennai Corporation AIDS Prevention and Control Society; CCOORR=Christian Council for for Rural Development & Research

5.5.2. Total costs and cost profiles

The total costs of the projects are described graphically in Figure 5.1 and numerically in Table 5.5. The median total cost of the CSW projects is INR 839,644, ranging from INR 474,000 to INR 2.2 million. The projects in Andhra Pradesh are more costly on average with a median value of INR 1.2 million. This compares with median total costs of INR 726,320, INR 503,780 and INR 597,520 for CAPACS, CCOORR and TNSACS, respectively.

Figure 5.1: Variation in total costs by state, agency and target group, INR (2003 prices)



State: 1= Tamil Nadu (n=8), 2 = Andhra Pradesh (n=11); Fund agency (fund_agency): 1 = APSACS (n=11), 2 = CAPACS (n=2), 3 = CCOORR (n=2), 4 = TNSACS (n=4); Target group (tg2): 1 = CSWs (n=17), 2 = truckers (n=2)

Total costs vary across NGO projects and agencies (see Figure 5.1 and Table 5.5) as do the levels at which costs are incurred and the cost profiles (Table 5.6). Nine percent and 11% of total costs (median value), respectively, are incurred at the funding agency level for APSACS and TNSACS. The median value of the proportion of costs incurred at the agency level in APSACS hides a wide variation across the NGOs projects ranging from 4% to 14.6%. In contrast, for the CCOORR projects, 38% (median value) of costs are incurred at the agency level.

Table 5.5: Total cost and cost profiles of the case study HIV prevention projects, 000s INR (2003 prices)

	Funding agency	NGO code	Fixed Personnel	Training	Monitoring	Building & office costs	Vehicles	Total fixed	Variable personnel	Peer educators	IEC materials	STI treatment	Condoms	Meetings	Transport	Other	Total variable	Total NGO	Agency	Total
Tamil Nadu	CAPACS	13	153.00	-	3.00	95.12	6.39	257.51	195.97	38.49	4.90	-	15.80	32.54	11.97	-	299.67	557.18	120.40	677.58
		14*	50.70	-	1.37	202.48	-	254.55	194.27	132.63	0.42	30.02	23.67	3.29	15.82	-	400.12	654.66	120.40	775.06
	Median		101.85	-	2.19	148.80	3.19	256.03	195.12	85.56	2.66	15.01	19.73	17.92	13.89	-	349.89	605.92	120.40	726.32
	CCOORR	1	45.44	-	7.10	19.24	-	71.78	66.00	19.84	28.57	-	100.10	47.00	6.24	4.53	272.29	344.07	189.19	533.25
		7	58.00	-	9.05	28.75	0.97	96.77	55.00	46.72	5.06	-	50.28	20.72	10.56	-	188.34	285.11	189.19	474.30
	Median		51.72	-	8.08	24.00	0.48	84.28	60.50	33.28	16.82	-	75.19	33.86	8.40	2.26	230.31	314.59	189.19	503.78
	TNSACS	6*	77.40	4.50	5.26	56.32	4.58	148.05	105.60	121.50	92.99	77.65	8.90	48.87	57.24	-	512.75			
		8	58.01	-	6.00	83.60	5.98	153.59	54.00	181.50	2.62	14.55	18.58	23.59	7.98	-	302.82	456.41	64.21	520.62
		16	117.58	9.95	3.27	110.58	2.51	243.89	162.60	42.14	41.17	0.65	0.48	20.04	25.08	0.80	292.96	536.85	64.21	601.06
		17	77.01	1.45	2.00	56.76	-	137.22	143.10	138.75	1.37	44.49	16.56	36.90	11.36	-	392.54	529.76	64.21	593.97
	Median		77.20	2.98	4.27	70.18	3.55	150.82	124.35	130.13	21.89	29.52	12.73	30.25	18.22	-	347.68	533.30	64.21	597.52
	Median		67.51	-	4.27	70.18	1.74	150.82	124.35	84.11	4.98	7.60	17.57	28.07	11.66	-	301.24	533.30	92.31	597.52

Table 5.5 (cont): Total cost and cost profiles of the case study HIV prevention projects, 000s INR (2003 prices)

	Funding agency	NGO code	Fixed Personnel	Training	Monitoring	Building & office costs	Vehicles	Total fixed	Variable personnel	Peer educators	IEC materials	STI treatment	Condoms	Meetings	Transport	Other	Total variable	Total NGO	Agency	Total
Andhra Pradesh	APSACS	2	173.06	12.37	38.51	194.46	6.87	425.27	273.13	47.41	1.43	46.49	88.89	97.45	74.13	16.64	645.58	1,070.85	105.47	1,176.32
		3	152.64	11.15	30.39	122.38	7.06	323.61	260.42	90.74	9.68	26.90	45.11	26.62	14.76	16.93	491.16	814.76	105.47	920.24
		4	255.59	6.50	31.76	151.84	2.49	448.18	240.03	184.65	33.82	20.66	2.58	14.85	57.48	62.39	616.45	1,064.63	105.47	1,170.10
		5^	220.97	22.28	33.90	99.38	11.98	388.51	161.58	65.10	2.84	16.99	11.55	24.67	43.57	17.89	344.18	732.69	102.63	835.33
		9	347.76	71.45	22.97	222.37	12.72	677.26	270.09	539.72	28.66	97.85	310.04	60.79	102.91	28.21	1,438.25	2,115.51	105.47	2,220.99
		10	142.32	5.14	22.97	108.23	99.85	378.50	208.01	26.00	15.79	48.77	23.46	30.27	88.89	16.64	457.84	836.34	122.60	958.94
		11	157.20	1.54	30.22	96.85	0.25	286.06	163.50	49.38	14.67	18.33	66.27	29.21	72.74	16.91	431.00	717.07	122.60	839.66
		12^*	208.42	27.04	57.85	135.88	54.56	483.74	554.20	76.77	89.40	185.54	65.61	59.69	128.93	16.64	1,176.78	1,660.53	94.56	1,755.09
		15	289.80	13.13	31.87	203.89	30.05	568.74	251.28	297.57	19.31	86.41	88.53	47.95	75.88	68.19	935.12	1,503.87	105.47	1,609.34
		18	196.44	8.51	37.87	172.91	2.88	418.61	212.42	14.40	38.98	66.96	126.02	60.41	84.38	35.83	639.39	1,058.00	105.47	1,163.48
		19	207.01	7.09	23.94	79.58	-	317.63	185.10	103.54	23.12	31.43	35.86	6.77	65.10	49.14	500.07	817.70	122.60	940.29
	Median		207.01	11.15	31.76	135.88	7.06	418.61	240.03	76.77	19.31	46.49	65.61	30.27	74.13	17.89	616.45	1,058.00	105.47	1,163.48
CSW projects	Median		152.64	5.14	22.97	108.23	2.88	286.06	194.27	90.74	15.79	30.02	35.86	30.27	57.24	16.64	457.84	717.07	105.47	839.66
	Minimum		45.44	-	1.37	19.24	-	71.78	54.00	14.40	0.42	-	0.48	3.29	6.24	-	188.34	285.11	64.21	474.30
	Maximum		347.76	71.45	38.51	222.37	99.85	677.26	273.13	539.72	92.99	97.85	310.04	97.45	102.91	68.19	1,438.25	2,115.51	189.19	2,220.99

^ truckers/ healthy highway projects;*NGO project provide STI services directly .

Table 5.6: Cost profiles of the case study HIV prevention projects, % of total costs

	Funding agency	NGO code	Fixed Personnel	Training	Monitoring	Building & office costs	Vehicles	Total fixed	Variable personnel	Peer educators	IEC materials	STI treatment	Condoms	Meetings	Transport	Other	Total variable	Total NGO	Agency	Total
Tamil Nadu	CAPACS	13	22.6	-	0.4	14.0	0.9	38.0	28.9	5.7	0.7	-	2.3	4.8	1.8	-	44.2	82.2	17.8	100.0
		14	6.5	-	0.2	26.1	-	32.8	25.1	17.1	0.1	3.9	3.1	0.4	2.0	-	51.6	84.5	15.5	100.0
	Median		14.6	-	0.3	20.1	0.5	35.4	27.0	11.4	0.4	1.9	2.7	2.6	1.9	-	47.9	83.3	16.7	100.0
	CCOORR	1	8.5	-	1.3	3.6	-	13.5	12.4	3.7	5.4	-	18.8	8.8	1.2	0.8	51.1	64.5	35.5	100.0
		7	12.2	-	1.9	6.1	0.2	20.4	11.6	9.9	1.1	-	10.6	4.4	2.2	-	39.7	60.1	39.9	100.0
	Median		10.4	-	1.6	4.8	0.1	16.9	12.0	6.8	3.2	-	14.7	6.6	1.7	0.4	45.4	62.3	37.7	100.0
	TNSACS	6	10.7	0.6	0.7	7.8	0.6	20.4	14.6	16.8	12.8	10.7	1.2	6.7	7.9	-	70.7	91.1	8.9	100.0
		8	11.1	-	1.2	16.1	1.1	29.5	10.4	34.9	0.5	2.8	3.6	4.5	1.5	-	58.2	87.7	12.3	100.0
		16	19.6	1.7	0.5	18.4	0.4	40.6	27.1	7.0	6.8	0.1	0.1	3.3	4.2	0.1	48.7	89.3	10.7	100.0
		17	13.0	0.2	0.3	9.6	-	23.1	24.1	23.4	0.2	7.5	2.8	6.2	1.9	-	66.1	89.2	10.8	100.0
	Median		12.1	0.4	0.6	12.8	0.5	26.3	19.3	20.1	3.7	5.1	2.0	5.4	3.0	-	62.1	89.3	10.7	100.0
	Median		11.7	-	0.6	11.8	0.3	26.3	19.3	13.3	0.9	1.5	2.9	4.7	2.0	-	51.3	86.1	13.9	100.0

Table 5.6 (cont.): Cost profiles of the case study HIV prevention projects, % of total costs

	Funding agency	NGO code	Fixed Personnel	Training	Monitoring	Building & office costs	Vehicles	Total fixed	Variable personnel	Peer educators	IEC materials	STI treatment	Condoms	Meetings	Transport	Other	Total variable	Total NGO	Agency	Total
Andhra Pradesh	APSACS	2	14.7	1.1	3.3	16.5	0.6	36.2	23.2	4.0	0.1	4.0	7.6	8.3	6.3	1.4	54.9	91.0	9.0	100.0
		3	16.6	1.2	3.3	13.3	0.8	35.2	28.3	9.9	1.1	2.9	4.9	2.9	1.6	1.8	53.4	88.5	11.5	100.0
		4	21.8	0.6	2.7	13.0	0.2	38.3	20.5	15.8	2.9	1.8	0.2	1.3	4.9	5.3	52.7	91.0	9.0	100.0
	**	5	26.5	2.7	4.1	11.9	1.4	46.5	19.3	7.8	0.3	2.0	1.4	3.0	5.2	2.1	41.2	87.7	12.3	100.0
		9	15.7	3.2	1.0	10.0	0.6	30.5	12.2	24.3	1.3	4.4	14.0	2.7	4.6	1.3	64.8	95.3	4.7	100.0
		10	14.8	0.5	2.4	11.3	10.4	39.5	21.7	2.7	1.6	5.1	2.4	3.2	9.3	1.7	47.7	87.2	12.8	100.0
		11	18.7	0.2	3.6	11.5	0.0	34.1	19.5	5.9	1.7	2.2	7.9	3.5	8.7	2.0	51.3	85.4	14.6	100.0
	**	12	11.9	1.5	3.3	7.7	3.1	27.6	31.6	4.4	5.1	10.6	3.7	3.4	7.3	0.9	67.0	94.6	5.4	100.0
		15	18.0	0.8	2.0	12.7	1.9	35.3	15.6	18.5	1.2	5.4	5.5	3.0	4.7	4.2	58.1	93.4	6.6	100.0
		18	16.9	0.7	3.3	14.9	0.2	36.0	18.3	1.2	3.4	5.8	10.8	5.2	7.3	3.1	55.0	90.9	9.1	100.0
		19	22.0	0.8	2.5	8.5	-	33.8	19.7	11.0	2.5	3.3	3.8	0.7	6.9	5.2	53.2	87.0	13.0	100.0
	Median		16.9	0.8	3.3	11.9	0.6	35.3	19.7	7.8	1.6	4.0	4.9	3.0	6.3	2.0	53.4	90.9	9.1	100.0
CSW Projects	Median		15.7	0.6	1.9	12.7	0.4	34.1	19.7	9.9	1.3	3.3	3.8	3.5	4.6	1.3	53.2	88.5	11.5	100.0
	Minimum		6.5	-	0.2	3.6	-	13.5	10.4	1.2	0.1	-	0.1	0.4	1.2	-	39.7	60.1	4.7	100.0
	Maximum		22.6	3.2	3.6	26.1	10.4	40.6	28.9	34.9	12.8	10.7	18.8	8.8	9.3	5.3	70.7	95.3	39.9	100.0

** truckers/ healthy highway projects

Variable costs of the CSW projects range from 39.7% to 70.7% of total costs, with a median value of 53.2%. Variable personnel (staff time) costs are the largest portion of variable costs for the CAPACS and APSACS projects and represent 27.0% and 19.7% of total costs, respectively. Within the APSACS group of projects there is a wide variation in staff costs as a proportion of the total, ranging from 12.2% to 28.9%. At CCOORR an anomalous high contribution of condoms (median: 14.7% of total costs) combined with low absolute staff costs have led to a low ratio of staff to variable costs. However, the method in which condom distribution is recorded is likely to have led to an over-estimate of condom costs at these projects[9].

The cost of peer education is on average the next largest part of variable costs and the greatest share of variable costs at TNSACS (median = 20.1%). Again the range is large: from 1.2% to 34.9% of total costs. No significant relationship, on average, is observed between the cost of peer educators and staff (Spearman's Rho = 0.1368, probability t<1 = 0.6764), although at some projects they may be a substitute and others a complement to staff.

The cost of education (IEC) materials as a percentage of total costs is highest at two TNSACS projects (12.8% and 6.8% at NGOs 6 and 16, respectively) that have close relations with and use donations of materials from a separate state-wide HIV prevention programme (APAC)[10] to support their activities; at a CCOORR project (5.4%, NGO 1) where the NGO also implements an HIV prevention project for the APAC programme and therefore shares materials; and at a truckers' project (5.1%, NGO 12) in Andhra Pradesh, which had a collection of materials developed and provided when it was initiated under a previous externally supported HIV prevention programme[11].

STI treatment forms a greater share of costs in those projects that operate STI clinics (NGOs: 14, 6, 17, 12), relative to other projects within the same funding agency group. This difference is not statistically significant (Pearson's chi squared = 1.6410, Pr =0.2) and there may be other factors influencing this part of the cost ratio e.g. the share of peer educator costs is also low where the share of STI treatment costs is high.

1.

[9] In monitoring the intervention, the NGO staff are required to assess not only what the intervention itself is doing but also its project partners. For this reason staff visit health facilities and other project partners to obtain data on condoms distributed and STIs treated to the target community. These figures are included in the final monitoring reports and could be seen as inflating the direct output of the project.

[10] AIDS Prevention and Control Project: a USAID funded HIV prevention programme running in parallel to the other programmes in Tamil Nadu.

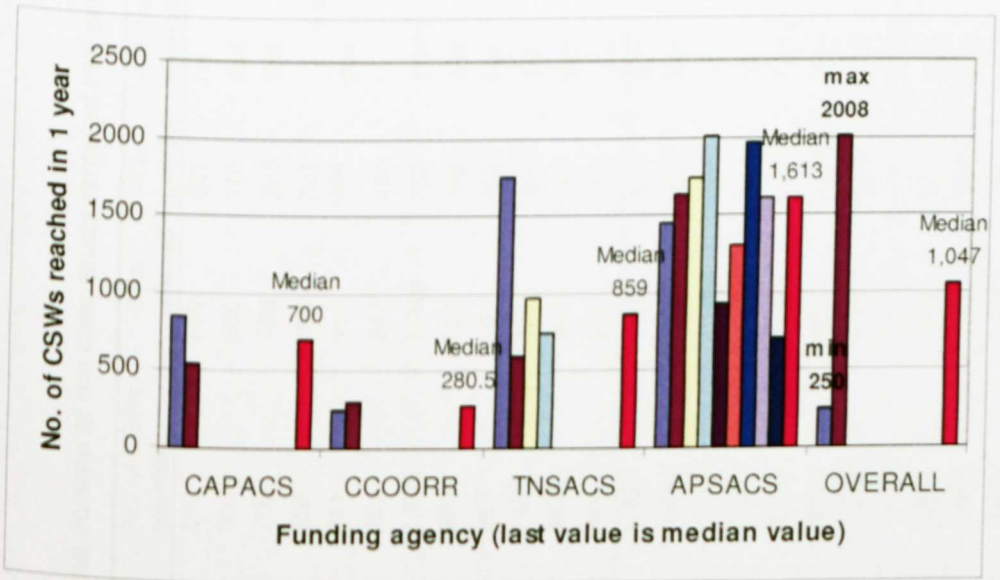
[11] The nationwide "Healthy Highways Programme" supported by the UK's Department for International Development

Transport costs are 4.6% of total costs at the median. There is large variation in this part of the cost profile, from 1.2% to 9.3%. Fixed cost profiles also show a degree of variability. Personnel make up the most important fixed cost with a median value of 15.7%, ranging from 6.5% to 22.6% of total costs. Building expenses is another major fixed cost (median = 12.7%, ranging from 3.6% to 26.1%). The maximum value for the share of building costs observed at NGO 14 is due to the combination of low personnel inputs, high rental prices in their locality and rental of a clinic in addition to NGO office space. Training costs appear low in Table 5.5 and Table 5.6, as the majority of these costs are incurred at the agency level. As can be seen in Appendix 11, training costs comprise between 6.1% and 27.5% of agency costs, where training costs are covered by the funding agency and once the NGO has completed the start up training – defined here as the training received in the first year of the project.

5.5.3. Scale of the HIV prevention projects

Coverage of the CSW projects is shown in Figure 5.2 and Table 5.7. As with costs coverage of the projects varies considerably, from 250 to 2008 CSWs reached. The median coverage levels for CAPACS, CCOORR, TNSACS and APSACS are 700, 281, 859 and 1,610 people reached, respectively. The two truckers' projects reach 14,390 and 7,985 people each per year.

Figure 5.2: Number of CSW's reached in one year by case study CSW projects for year of analysis



Note: APSACS= Andhra Pradesh State AIDS Control Society; TNSACS=Tamil Nadu State AIDS Control Society; CAPACS=Chennai Corporation AIDS Prevention and Control Society; CCOORR=Christian Council for for Rural Development & Research; STI = sexually transmitted infections; CSW = commercial sex worker

Table 5.7: Coverage and volume of the case study targeted HIV prevention projects for the year of analysis

State	Funding agency	NGO	No. of CSWs reached	STIs referred	STIs treated	Condoms distributed	1st contacts with TG	All contacts with TG	All contacts
Tamil Nadu	CAPACS	13	850	850	621	na	45,155	985	1429
		14*	550	550	110	255	66,455	821	4429
	Median		*700*	*700*	*366*	*255*	55,805	*903*	*2929*
	CCOORR	1	250	250	227	n/a	250,250	n/a	
		7	311	311	684	404	125,706	n/a	n/a
	Median		*281*	*281*	*456*		187,978		
	TNSACS	6*	1,749	1,749	162	1,240	22,250	358	
		8	600	600	192	256	49,200	n/a	n/a
		16	967	967	455	164	11,030	1,029	
		17	750[1]	750	203	190	65,300	n/a	
	Median		*859*	*859*	*198*	*223*	*35725*	*694*	
	Median		*675*	*675*	*215*	*255*	*57250*	*903*	*2929*
Andhra Pradesh	APSACS	2	1,455	1,455	607	625	226,249	709	4,129
		3	1,634	1,634	439	432	141,701	1,230	3,353
		4	1,748	1,748	498	197	26,209	465	16,122
		5^	7,985	7,985	541	526	28,868	7,023	9,608
		9	2,008	2,008	1,331	1,001	835,695	2,008	6,882
		10	935	935	1,035	272	94,530	663	5,368
		11	1,301	1,301	249	148	165,670	851	4,022
		12^*	14,390	14,390	n/a	1,046	164,020	15,270	17,035
		15	1,964	1,964	851	756	258,069	991	3,965
		18	1,613	1,613	600	574	315,038	1,445	5,814
		19	1,047	1,047	197	197	89,650	675	7,495
	Median		*1,613*	*1,613*	*600*	*432*	*165,670*	*851*	*5,368*

Table 5.8 (cont.): Volume of the case study targeted HIV prevention projects for the year of analysis

State	Funding agency	NGO	No. of CSWs reached	STIs referred	STIs treated	Condoms distributed	1st contacts with TG	All contacts with TG	All contacts
CSW projects	*Median*		1,047	1,047	455	264	94,530	851	4,429
	Min		*250*	*250*	*110*	*148*	*11,030*	*358*	*1,429*
	Max		*14,390*	*14,390*	*1,331*	*1,240*	*835,695*	*2,008*	*16,122*

n/a = not available; ^ truckers'/healthy highways project; *NGO project provide STI services directly; ¶ planned coverage target

Volume of the projects was measured using 6 variables (see Table 5.1 and Chapter 3). As coverage levels varied across the projects, comparisons of service volume were made by first dividing the volume descriptors by coverage. Large variations in service volume continue to be observed. Table 5.8 shows for example that the median number of condoms distributed per person reached are 47, 87 and 101 for the TNSACS CAPACS and APSACS projects, respectively; and the higher number of 703 is observed for the CCOORR projects. This is equivalent to 0.96, 1.7, 1.9 and 13.5 condoms per person per week, respectively and varies widely between the projects themselves. Similarly, the number of STIs treated ranges from 0.11 to 0.71 per person reached. This compares with an average prevalence of STIs of 48% measured in the CSW communities of NGOs 2 and 3 (Bhuyan, Shobarani et al., 2001). The maximum value is incurred by NGO 6 which treats 0.71 STIs per person reached. This high number may be due to their STI clinic enabling them to treat beyond the target population and to encourage other projects without this facility to refer there, inflating their numbers. Both the truckers' projects treat 0.07 infections per person reached, in a population with estimated prevalence rates of syphilis and gonorrhoea of 9.6 percent and 7.5 percent, respectively (Ekstrand, Garbus et al., 2003).

No statistically significant relationship between coverage and volume was found. Table 5.9 indicates that we cannot reject the null hypothesis that there is no correlation except in the cases of coverage with STIs treated and 1st contacts with the target group.

Table 5.8: Output per person reached for the case study HIV prevention projects in the year of analysis

State	Funding agency	NGO	Output per CSW covered					
			STIs referred	STIs treated	Condoms distributed	1st contacts with TG	All contacts with TG	All contacts
Tamil Nadu	CAPACS	13	0.73	n/a	53	1.16	1.68	2.94
		14*	0.20	0.46	121	1.49	8.05	8.75
	Median		0.47	0.46	87	1.33	4.87	5.84
	CCOORR	1	0.91	n/a	1,001	n/a	n/a	n/a
		7	2.20		404			
	Median		1.55		703			
	TNSACS	6*	0.09	0.71	13	0.20	n/a	n/a
		8	0.32	0.43	82	n/a		
		16	0.47	0.17	11	1.06		
		17	0.27	0.25	87	n/a		
	Median		0.30	0.34	47	0.63		
	Median		0.40	0.43	85	1.11	4.87	5.84
Andhra Pradesh	APSACS	2	0.42	0.43	155	0.49	2.84	3.14
		3	0.27	0.26	87	0.75	2.05	2.61
		4	0.28	0.11	15	0.27	9.22	10.19
		5^	0.07	0.07	4	0.88	1.20	1.30
		9	0.66	0.50	416	1.00	3.43	3.88
		10	1.11	0.29	101	0.71	5.74	6.34
		11	0.19	0.11	127	0.65	3.09	3.27
		12^*	n/a	0.07	11	1.06	1.18	1.19
		15	0.43	0.38	131	0.50	2.02	2.30
		18	0.37	0.36	195	0.90	3.60	3.83
		19	0.19	0.19	86	0.64	7.16	7.16
	Median		0.33	0.26	101	0.71	3.09	3.27
CSW projects	Median		0.37	0.32	101	0.71	3.43	3.83
	Min		0.09	0.11	11	0.20	1.68	2.30
	Max		2.20	0.71	1,001	1.49	9.22	10.19

n/a = not available; ^ truckers'/healthy highways project; *NGO project provide STI services directly .

Table 5.9: Spearman's rank order test of relationship between coverage (cost per person reached) and volume of the CSW HIV prevention projects (Null hypothesis: there is no relationship between coverage and the volume variable)

	N	Spearman's Rho
STIs referred	17	0.3235
STIs treated	14	0.6205*
Condoms distributed	17	0.2304
1st contacts with TG	15	0.4500**
All contacts with TG	11	0.2091
All contacts	11	0.3455

* significant at 5%; **significant at 10%; ns = not significant; TG = target group; STIs= Sexually transmitted infections.

5.5.4. Average costs of the HIV prevention projects

Average costs of the projects are summarized in Table 5.10. The cost per person reached ranges from INR 105 to INR 2,133. The median value over all projects is INR 797. The median cost per person reached of the CSW projects is INR 808 and the minimum is INR 415. For the truckers' projects, the costs are INR 105 and INR 122 per person reached each, which may be low due to the high coverage of population achieved. CCOORR projects have the highest median cost per person reached (INR 1,829). In contrast, the higher total cost APSACS projects have a median cost per person reached of 721Rs. The median cost per person reached of the TNSACS and CAPACS projects is INR 707 and INR 1,103, respectively.

Table 5.10: Average costs of the case study HIV prevention projects for the year of analysis, INR (2003 prices)

	Funding agency	*NGO code*	*Total cost per output unit*						
			No. of people reached	*STIs referred*	*STIs treated*	*Condoms distributed*	*1st contacts with TG*	*All contacts with TG*	*All contacts*
Tamil Nadu	CAPACS	13	797	1,091	n/a	15.0	688	474	271
		14*	1,409	7,046	3,039	11.7	944	175	161
	Median		1,103	4,069	3,039	13.3	816	325	216
	CCOORR	1	2,133	2,349	n/a	2.1	n/a	n/a	
		7	1,525	693		3.8			
	Median		1,829	1,521		3.0			
	TNSACS	6*	415	4,475	585	32.6	2,025	n/a	
		8	868	2,712	2,034	10.6	n/a		
		16	622	1,321	3,665	54.5	584		
		17	792	2,926	3,126	9.1	n/a		
	Median		707	2,819	2,580	21.6	1,305		
	Median		832	2,530	3,039	11.1	816	325	216
Andhra Pradesh	APSACS	2	808	1,938	1,882	5	1,659	285	257
		3	563	2,096	2,130	6	748	274	216
		4	669	2,350	5,940	45	2,516	73	66
		5^	105	1,544	1,588	29	119	87	80
		9	1,106	1,669	2,219	3	1,106	323	285
		10	1,026	927	3,526	10	1,446	179	162
		11	645	3,372	5,673	5	987	209	197
		12^*	122	n/a	1,678	11	115	103	103
		15	819	1,891	2,129	6	1,624	406	356
		18	721	1,939	2,027	4	805	200	188
		19	898	4,773	4,773	10	1,393	125	125
	Median		721	1,939	2,130	6	1,106	200	188
CSW projects	Median		808	2,096	2,629	9	1,106	209	197
	Min		415	693	585	2	584	73	66
	Max		2,133	7,046	5,940	54	2,516	474	356

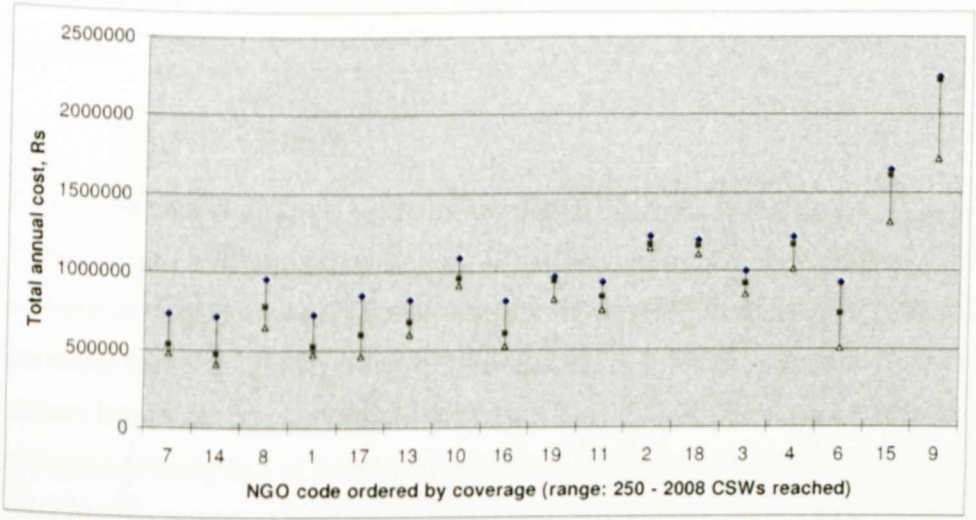
n/a = not available; ^ truckers'/healthy highways project;*NGO project provide STI services directly.

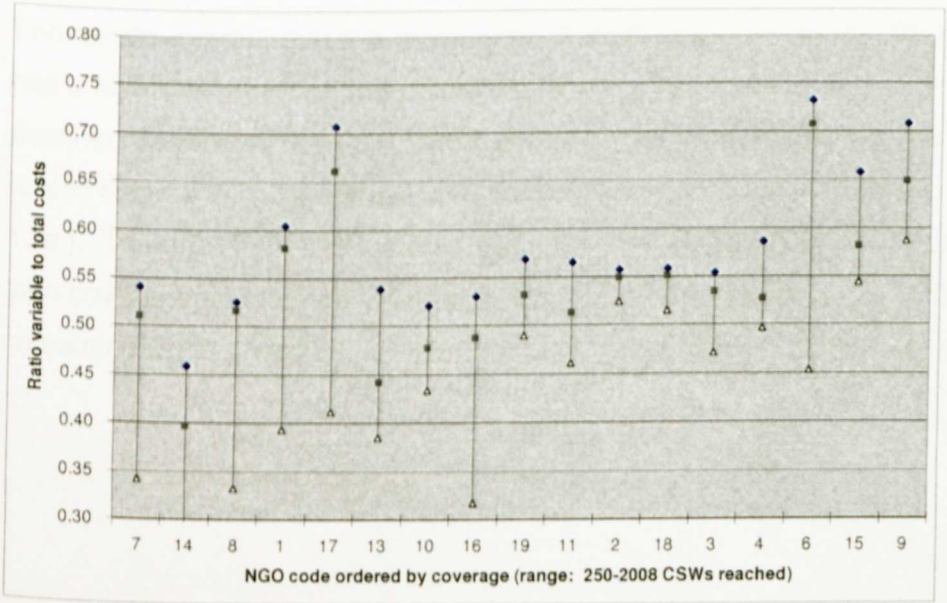
Variation is also evident in the cost per unit of volume of services. For example, the median cost per STI treated and cost per 1st contact with the target group, over all projects, are INR 2,174 (range: INR 585 to 5,940) and INR 987 (range: INR 115 to 2,516), respectively. For CSW projects only, the median values are INR 2,629 (range unchanged) and INR 1,106 (range: INR 584 to 2,516).

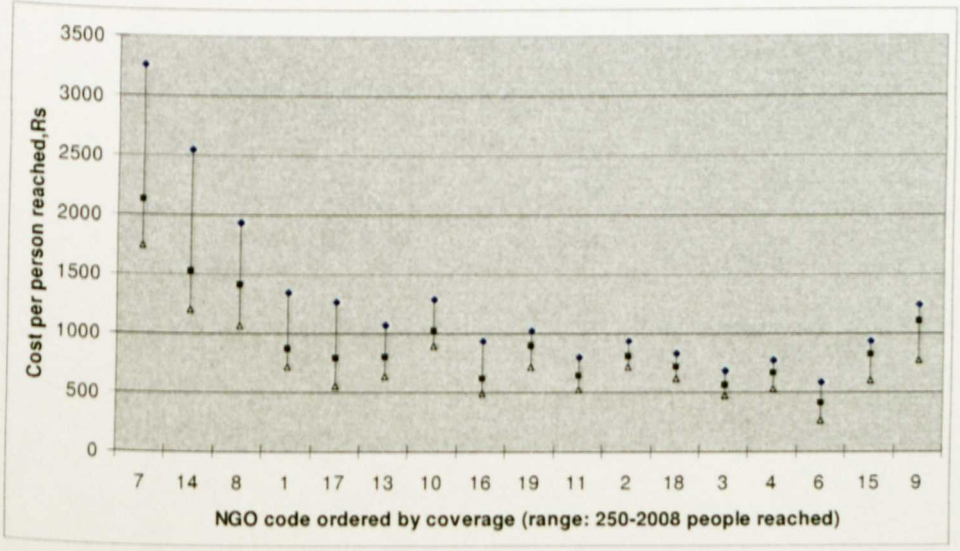
5.5.5. Addressing uncertainty

Figure 5.3 shows the low and high estimates of total cost, variable to total cost ratio and cost per person reached resulting from the one-way analysis of uncertainty. Details are provided in Appendix 19. The uncertainty varies across the projects, as measured by the range and the range as a percentage of the value generated for the baseline analysis. The range of total project costs lies between INR 7,407 and INR 529,825 and 6% and 66% of the baseline value. The average cost range (two-way analysis) is between INR 35 and INR 1,512 and 27% and 89% of the original values.

Figure 5.3: Impacts of data uncertainties on total cost, cost profile (variable as a percentage of total costs) and average costs







5.6. *Results: scale and other causes of cost variation*

This section explores the reasons for variations in total and average costs, including scale. It then examines whether these relationships still hold under the sensitivity analysis.

5.6.1. Scale

As can be seen in Figure 5.3 total costs and the ratio of variable to total costs appear to increase and average costs appear to decline as coverage increases. Total cost has statistically significant and positive relationships with both coverage and all but one (all contacts with the target group) of the indicators of volume (Table 5.11). Figure 5.4 shows how total costs increase with coverage and suggests that total costs do not increase linearly but at an increasing rate. Regression analysis confirms a positive relationship between total costs and scale, in the form of coverage (see Figure 5.4). The results indicate that this relationship is likely to be non-linear. The quadratic model has a higher R^2 than the linear form, supporting the non-linearity hypothesis. The positive relationship between total costs and scale also applies to volume indicators. It is less clear whether these are linear relationships or not (see Figure 5.1 and Appendix 13a.). Table 5.11 shows that the ratio of variable to total costs also increases positively with coverage and number of STIs treated. The relationship of this ratio with the remaining scale variables is more ambiguous (see Table 5.11 and Appendix 13b.).

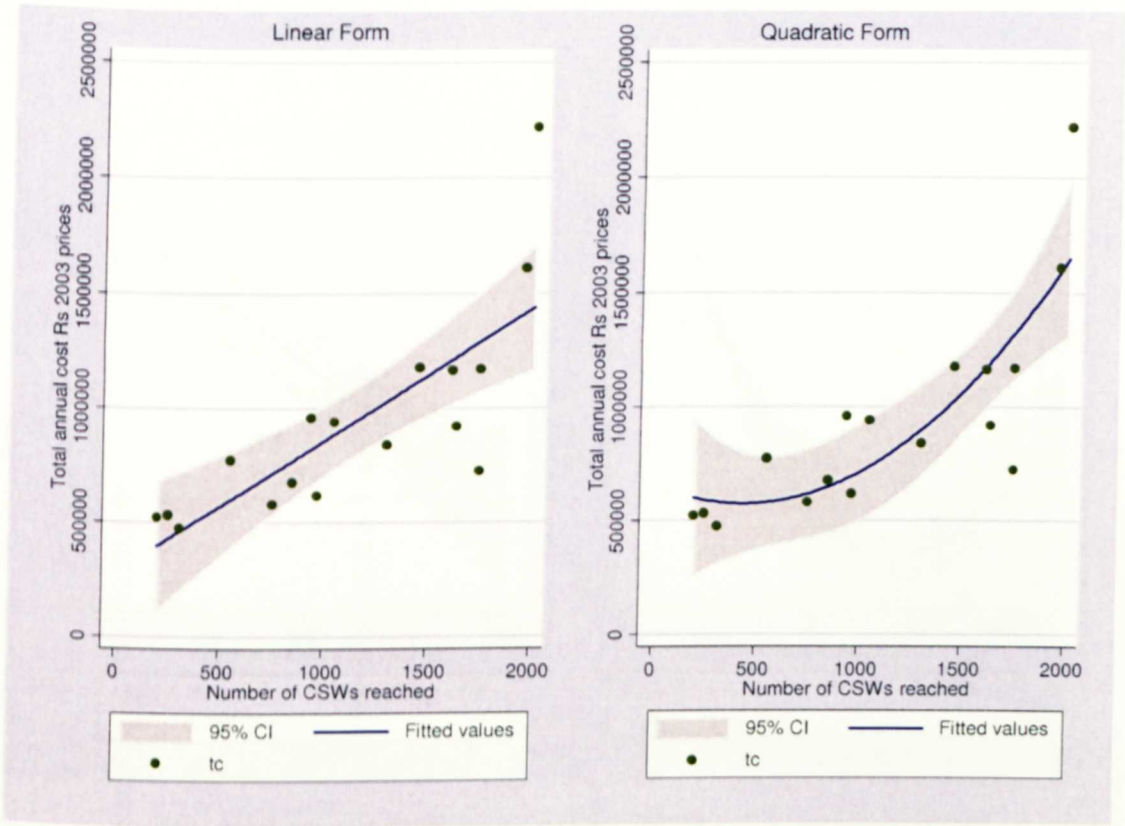
Table 5.11: Spearman rank order tests of total cost, cost profiles, average costs relationships with scale (CSW projects only)

	Total cost		*Cost profile*		*Average costs*	
	N	Spearman's Rho	N	Spearman's Rho	N	Spearman's Rho
Coverage	17	0.7990*	17	0.5415*	17	-0.5221*
STIs referred	17	0.4828*	17	-0.2642	17	-0.8750*
STIs treated	14	0.5017**	14	0.5692*	14	-0.7987*
Condoms distributed	17	0.4804**	17	0.1243	17	-0.9216*
1st contacts with TG	15	0.4500**	15	0.0395	15	-0.7964*
All contacts with TG	11	0.4273	11	0.2989	11	-0.7182*
All contacts	11	0.5545**	11	0.4368	11	-0.5000

* significant at 5%; **significant at 10%; ns = not significant; TG = target group; STIs= Sexually transmitted infections;

We can also reject the null hypothesis that there is no relationship between average cost and measures of scale. The results of the non-parametric tests of cost per unit of scale against the respective scale unit are all negative and, with the exception of all contacts, statistically significant (Table 5.11). The scale variables explain over 70% of the variation in average costs for all average cost measures except cost per person reached and cost per contact. The scatter plots in Figure 5.5 and Appendix 13c illustrate these and suggest non-linear relationships between average costs and scale. As the unit of scale increases, average costs fall at a decreasing rate for all volume variables. It also appears that average costs are higher at both lower and higher levels of coverage. Comparing linear and quadratic models of average costs against coverage, it appears that the non-linear model is a better fit and there is a fitted line resembling a classic 'u' shaped average cost curve.

Figure 5.4: Scatter plots and fitted regression lines (linear and quadratic forms) of total costs against coverage of the CSW projects, INR (2003 prices)

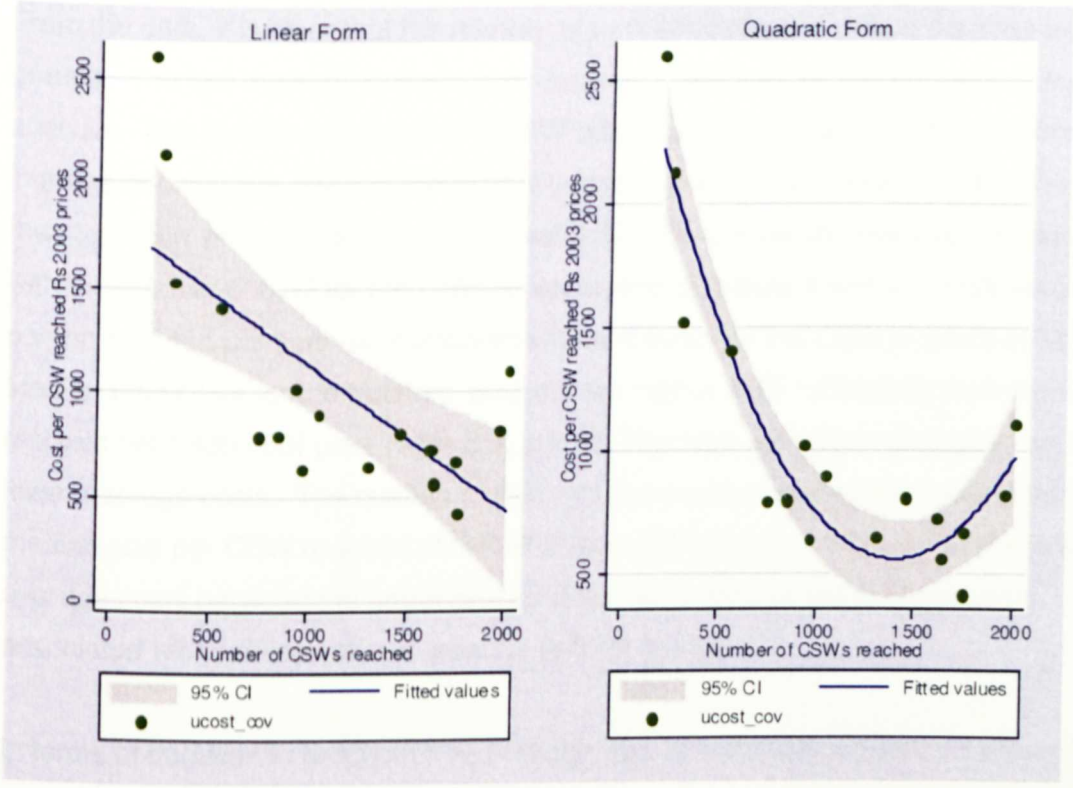


Key: tc = total cost; 95%CI = 95% confidence interval

		N	*F*	*Adj R-squared*	*Coefficient*	*Coefficient (sq)*	*Constant*
CSWs reached	linear	17	22.61*	0.5746	575.55*		280954.4*
	quadratic		15.38*	0.6425	383.02	0.4358*	658893.9
STIs referred	linear	17	16.48*	0.4917	949.47*		462750.6*
	quadratic		10.87*	0.5523	-356.24	0.9999**	755843.9*
STIs treated	linear	14	4.74**	0.2234	698.85*		700530.6*
	quadratic		4.69*	0.3622	3038.49*	-1.8393**	222627.9
Condoms distributed	linear	17	28.35*	0.6309	1841.95*		633209.8*
	quadratic		13.53*	0.6104	1351.54	0.6096	675171.9*
Target group 1st contacts	linear	15	13.04*	0.4624	619.72*		480004.1*
	quadratic		8.21*	0.5074	-26.96	0.3427	695912.8*
Target group all contacts	linear	11	0.5	-0.0526	26.43		980611.5*
	quadratic		1.13	0.025	217.04	-0.0104	367218.4
All contacts	linear	11	0.53	-0.0496	25.38		970238.4*
	quadratic		1.61	0.1088	283.44	-0.01214	6640.153

* significant at 5%; **significant at 10%

Figure 5.5: Scatter plots and fitted regression lines (linear and quadratic forms) of costs per person reached against coverage of the CSW projects, INR (2003 prices)



Key: ucost_cov = cost per person reached; 95%CI = 95% confidence interval

		N	*F*	*Adj R-squared*	*Coeffi-cient*	*Coeffi-cient (sq)*	*Constant*
CSWs reached	linear	17	16.56*	0.4931	-0.7013*		1831.02*
	quadratic		48.83*	0.8567	-3.2228*	0.0011*	2825.20*
STIs referred	linear	17	11.45*	0.3951	-3.1191*		4115.19*
	quadratic		15.13*	0.6385	-11.2303*	0.0062*	5935.93*
STIs treated	linear	14	13.88*	0.4976	-3.2667*		4525.05*
	quadratic		8.13*	0.5231	-7.8993**	0.0036	5471.33*
Condoms distributed	linear	17	4.2**	0.1668	-0.0365**		19.75*
	quadratic		7.58*	0.4513	-0.1651*	0.0002*	30.7510*
Target group 1st contacts	linear	15	5.16*	0.229	-9.2491*		11561.08*
	quadratic		7.78*	0.492	-33.7229*	0.0130*	19732.15*
Target group all contacts	linear	11	7.93*	0.4094	-0.0214*		369.99*
	quadratic		5.79*	0.4893	-0.0657**	0.0000	512.69*
All contacts	linear	11	6.09*	0.3374	-0.0126*		288.29*
	quadratic		2.74	0.2578	-0.0177	0.0000	307.22*

* significant at 5%; **significant at 10%

5.6.2. Production technology

Identified variations in production technology or method of service delivery included different services for different target groups and different methods for STI management within the sample of CSW projects. However, with only two trucker projects and only two CSW projects delivering their own STI services, it is not possible to make statistical

comparisons and it is difficult to draw firm conclusions about differences in costs between these groups.

From the data, it is clear that the number of people covered is different across target groups. The two truckers' projects are reaching 7,985 and 14,390 people in the year of analysis. The median coverage of a CSW project is 967. In spite of the greater scale in terms of coverage, the volume of services provided by the truckers' projects is lower than the CSW projects: both projects treat 0.07 STIs per person reached compared with the median of 0.32 for the CSW projects; and distribute 4 and 11 condoms per person reached per year, as compared with a median for the CSW projects of 101. Median total costs for the truckers' projects are higher (INR 1,295,210) than the CSW projects (INR 839,660) (see Table 5.5, p.133). The high coverage rates give rise to lower average costs. The median of INR 113 per person reached compares with a median cost per CSW reached of INR 800 (see Table 5.10, p.143). This differential in average costs between the target groups does not extend to the average costs associated with service volume (see Table 5.10, p.143).

In terms of variation in production technology, two of the three projects providing STI services are covering larger than the median population size (see Table 5.7, p.139). However, one of these is a truckers' project. The total costs of each of the three projects are on the higher side within their respective funding agency groups, indicating that it is more costly to provide STI services but that this might facilitate outreach to a larger group of people (see Table 5.5, p.133). In spite of this, there does not appear to be a pattern regarding the average costs: the costs per person reached are INR 415 and INR 1,409 and the costs per STI treated are INR 585 and INR 3,039, respectively, for the CSW projects with STI clinics.

5.6.3. Context

Variations in context are defined by two variables: literacy of the local population; and the state in which the project operates (see Table 5.1). There is clearly a cost differential between the state locations (see Figure 5.1) with lower total costs in Tamil Nadu. Table 5.12 shows that total costs have a significant relationship with state and a significant negative relationship with literacy.

Table 5.12: Median and Spearman's rank order tests of total costs and cost profiles relationships with factors hypothesised to cause variation in the CSW HIV prevention projects

Possible cause of variation	Test	N	Test statistic	
			Total costs	Variable/Total costs
State	Median test ($\chi 2$)	17	10.1011*	0.0664
Funding agency		17	13.4321*	5.0698
Fund batch (AP only)		9	1.4063	1.4063
STI service provision		17	1.3560	0.1563
FCRA		17	1.3506	0.3506
Budget	Spearmans Rho	15	0.9071*	0.1643
Project age		17	0.5056	0.7612*
NGO expenditure		14	-0.0110	0.1033
Staff share		16	0.0441	-0.0235
Literacy		17	-0.8357*	-0.1415

* significant at 5%; **significant at 10%; CSW = commercial sex worker; AP = Andhra Pradesh; TN = Tamil Nadu; STI = sexually transmitted infection; FCRA = certification for receiving of foreign funds.

The median coverage is also different: it is approximately 2.5 times higher in Andhra Pradesh than in Tamil Nadu yet this does not result in a statisticially significantly association with state (see Table 5.13). Similarly, Table 5.14 shows that the median average cost is lower in all scale variables for Andhra Pradesh than for Tamil Nadu, except cost per 1st contact with the target group, but this difference is not statistically significant. On the other hand, literacy is significantly associated with coverage (see Table 5.15). A statistically significant difference does not extend to the relationship of average costs (see Table 5.16) but, counter-intuitively, average costs are lower in areas of lower literacy (all in the state of Andhra Pradesh).

Table 5.13: Median tests of scale relationships with state, funding agency, fund batch, FCRA certification and method of STI service provision(CSW projects only). (Null hypothesis: there is no relationship between scale and the explanatory variable)

Measure of scale	N	Statistic	State		Funding agency				Fund batch (Andhra Pradesh only)		FCRA		STI service provision	
			Tamil Nadu (n=8)	Andhra Pradesh (n=11)	CAPACS (n=2)	CCOORR (n=2)	TNSACS (n=4)	APSACS (n=9)	SMA1 (n=6)	SMA2 (n=3)	Yes (n=14)	No (n=3)	Yes (n=2)	No (n=15)
Coverage	15	Median	675	1,613	700	281	1455	1,613	1691	1,047	1251	850	1150	1,047
		Range	(250 - 1,749)	(935 - 2,008)	(550 - 850)	(250 - 14,390)	(600 - 1,749)	(935 - 2,008)	(1,455 - 2,008)	(935 - 1,301)	(250 - 2,008)	(311 - 1,301)	(550 - 1,749)	(250 - 2,008)
		χ^2	1.8862			4.9554*			1.4063		0.1365		0.0048	
STIs referred	17	Median	215	600	366	456	607	600	604	249	447	621	136	498
		Range	(110 - 684)	(197 - 1,331)	(110 - 621)	(227 - 1,331)	(162 - 455)	(110 - 1,331)	(439 - 1,331)	(197 - 1,035)	(110 - 1,331)	(249 - 684)	(110 - 162)	(192 - 1,331)
		χ^2	1.5159			4.9483			0.0563		0.0126		0.4427	
STIs treated	14	Median	255	432	255	0	625	432	600	197	272	148	748	264
		Range	(164 - 1,240)	(148 - 1,001)	(255 - 255)	(0 - 1,240)	(164 - 1,240)	(148 - 1,001)	(197 - 1,001)	(148 - 272)	(164 - 1,240)	(148 - 148)	(255 - 1,240)	(148 - 1,001)
		χ^2	1.2444			3			1.4063		0		0.5833	
Condoms distributed (000s)	17	Median	57	166	56	188	226	166	242	95	92	126	44	126
		Range	(11 - 250)	(26 - 836)	(45 - 66)	(126 - 836)	(11 - 65)	(11 - 836)	(26 - 836)	(90 - 166)	(11 - 836)	(45 - 166)	(22 - 66)	(11 - 836)
		χ^2	1.5159			8.9722*			1.4063		0.0126		0.4427	
1st contacts with target group	15	Median	903	851	903	0	709	851	1111	675	821	918	590	985
		Range	(358 - 1,029)	(465 - 2,008)	(821 - 985)	(0 - 15,270)	(358 - 1,029)	(2 - 2,008)	(465 - 2,008)	(663 - 851)	(358 - 2,008)	(851 - 985)	(358 - 821)	(465 - 2,008)
		χ^2	0.1004			1.3839			1.4063		0.7443		0.0048	
All contacts with target group	11	Median	2929	5,368	2929	0	4129	5,368	4972	5,368	5368	2,726	4429	4,749
		Range	(1,429 - 4,429)	(3,353 - 16,122)	(1,429 - 4,429)	(0 - 17,035)	(0 - 0)	(3 - 16,122)	(3,353 - 16,122)	(4,022 - 7,495)	(3,353 - 16,122)	(1,429 - 4,022)	(4,429 - 4,429)	(1,429 - 16,122)
		χ^2	0.4125			0.4125			0.0563		0.4125		0.0092	
All contacts with community	11	Median	3655	5,928	3655	0	4571	5,928	5373	5,928	5928	3,377	4810	5,250
		Range	(2,499 - 4,810)	(4,254 - 17,812)	(2,499 - 4,810)	(0 - 17,812)	(0 - 0)	(0 - 17,812)	(4,260 - 17,812)	(4,254 - 7,495)	(4,260 - 17,812)	(2,499 - 4,254)	(4,810 - 4,810)	(2,499 - 17,812)
		χ^2	0.4125			0.4125			0.0563		0.4125		0.0092	

Table 5.14: Median tests of average cost relationships with state, funding agency, fund batch, FCRA certification and method of STI service provision (CSW projects only). (Null hypothesis: there is no relationship between the cost per unit of scale and the explanatory variable)

Cost (INR) per unit of:	N	Statistic	State		Funding agency				Fund batch (Andhra Pradesh only)		FCRA		STI service provision	
			Tamil Nadu (n=8)	Andhra Pradesh (n=11)	CAPACS (n=2)	CCOORR (n=2)	TNSACS (n=4)	APSACS (n=9)	SMA1 (n=6)	SMA2 (n=3)	Yes (n=14)	No (n=3)	Yes (n=2)	No (n=15)
Coverage	15	Median	832	721	1103	1,829	707	721	765	962	814	797	912	808
		Range	(415 - 2,133)	(563 - 1,106)	(797 - 1,409)	(1,525 - 2,133)	(415 - 868)	(563 - 1,106)	(563 - 1,106)	(645 - 1,026)	(415 - 2,133)	(645 - 1,525)	(415 - 1,409)	(563 - 2,133)
		χ^2	0.1004				4.0625		0.0563		0.0167		0.0048	
STIs referred	17	Median	2530	1,939	4069	1,521	2819	1,939	1939	2,632	2223	1,091	5761	1,939
		Range	(693 - 7,046)	(927 - 4,773)	(1,091 - 7,046)	(693 - 2,349)	(1,321 - 4,475)	(927 - 4,773)	(1,669 - 2,350)	(927 - 4,773)	(927 - 7,046)	(693 - 3,372)	(4,475 - 7,046)	(693 - 4,773)
		χ^2	0.5124				1.9479		0.0563		0.0126		0.7103	
STIs treated	14	Median	3039	2,130	3039	n/a	2580	2,130	2129	2,828	2219	5,673	1812	2,672
		Range	(585 - 3,665)	(1,882 - 5,940)	(3,039 - 3,039)		(585 - 3,665)	(1,588 - 5,940)	(1,882 - 5,940)	(1,678 - 5,673)	(585 - 5,940)	(5,673 - 5,673)	(585 - 3,039)	(1,882 - 5,940)
		χ^2	0.0000				1.1111		2.7563**		0		0.5833	
Condoms distributed (000s)	17	Median	11	6	13	3	22	6	6	10	10	5	22	6
		Range	(2 - 54)	(3 - 45)	(12 - 15)	(2 - 4)	(9 - 54)	(3 - 45)	(3 - 45)	(2 - 54)	(2 - 54)	(4 - 15)	(12 - 33)	(2 - 54)
		χ^2	0.5124				5.9618		0.0563		0.0126		0.4427	
1st contacts with target group	15	Median	816	1,106	816	n/a	1305	1,106	1365	1,046	1393	837	1485	1,106
		Range	(584 - 2,025)	(748 - 2,516)	(688 - 944)		(584 - 2,025)	(115 - 2,516)	(748 - 2,516)	(21 - 2,516)	(584 - 2,516)	(688 - 987)	(944 - 2,025)	(584 - 2,516)
		χ^2	0.1004				3.3929		0.0563		0.4353		0.0048	
All contacts with target group	11	Median	325	200	325	n/a	n/a	200	280	189	200	341	175	242
		Range	(175 - 474)	(73 - 406)	(175 - 474)			(73 - 474)	(73 - 406)	(6 - 474)	(73 - 406)	(209 - 474)	(175 - 175)	(73 - 474)
		χ^2	0.4125				0.4125		1.4063		0.4125		0.0092	
All contacts with community	11	Median	216	188	216	n/a	n/a	188	237	125	188	234	161	207
		Range	(161 - 271)	(66 - 356)	(161 - 271)			(4 - 356)	(66 - 356)	(4 - 356)	(66 - 356)	(197 - 271)	(161 - 161)	(66 - 356)
		χ^2	0.4125				0.4125		1.4063		0.4125		0.0092	

Table 5.15: Spearman rank order tests of scale relationships with potential causes of variation (CSW projects only). (Null hypothesis: there is no relationship between the measure of scale and the explanatory variable).

Measure of scale:	Spearman's Rho				
	Budget	Project age	NGO expenditure	HIV Staff share	Literacy
n	17	17	14	16	17
Coverage	0.7527*	0.2034	0.0549	0.1321	-0.5817*
STIs referred	0.7000*	-0.4205*	0.0418	-0.0441	-0.4923*
STIs treated	0.5039**	0.3123	-0.2916	-0.3389	-0.3389
Condoms distributed	0.6857*	-0.1722	-0.1648	-0.0324	-0.5600*
1st contacts with target group	0.4679**	-0.0146	0.1956	-0.0321	-0.4345**
All contacts with target group	0.3091	0.3082	0.4727	-0.2636	0.0782
All contacts with community	0.4727	0.4238	0.5727**	-0.3545	-0.0828

Table 5.16: Spearman rank order tests of average cost relationships with potential causes of variation (CSW projects only). (Null hypothesis: there is no relationship between the cost per unit of scale and the explanatory variable).

Cost (INR) per unit of:	Spearman's Rho									
	Budget	Project age	NGO expenditure	HIV Staff share	Literacy	PD price	PM price	ORW price	Administrative staff price	PE price
n	17	17	14	16	17	17	17	17	17	17
Coverage	0.1593	-0.0761	0.8166	0.1299	-0.1679	0.1107	-0.1907	-0.2353	-0.2868	-0.015
STIs referred	-0.3643	0.5079*	-0.1824	0.1794	0.1317	-0.2908	0.1058	-0.2108	0.098	0.5398*
STIs treated	-0.0549	-0.5335*	-0.0879	0.2967	0.0331	0.0387	0.1479	-0.1385	0.1604	0.0022
Condoms distributed	-0.5821*	0.2908	0.156	0.0353	0.2868	0.0221	-0.0467	-0.027	-0.1054	0.1155
1st contacts with target group	0.0769	0.2213	-0.2176	0.0143	0.0395	-0.358	-0.3767	-0.3857	-0.0393	-0.104
All contacts with target group	0.1818	-0.1637	-0.2727	-0.0367	-0.2207	0.492	-0.5104	0.7727*	-0.2909	-0.284
All contacts with community	0.3364	-0.0289	-0.2182	-0.0909	-0.3449	0.5196**	-0.4414	0.7364*	-0.2	-0.202

5.6.4. Funding agencies

From tables Table 5.12 and Table 5.13 it can also be seen that the variables representing budget and funding agency both have statistically significant relationships with total costs and coverage. The budget size explains over 90% of the variation in total costs and 75% of the variation in coverage. Despite this, no relationship is evident between funding agency and average costs (for all scale variables), statistically significant or otherwise (see Table 5.14), nor for budget and average costs (except for cost per condom distributed), with less than 40% of the variation explained (see Table 5.16). The hypotheses that average costs vary with the funding agency or budget are therefore rejected.

5.6.5. Programme maturity

Non-parametric test results do not allow the rejection of the null hypotheses that there is no relationship between project age and total costs (Table 5.12), scale (except STIs referred) (Table 5.15) and average costs (except cost per STI referred and treated) (Table 5.16). There does appear to be a significant relationship between the ratio of variable to total costs and project age (Table 5.13).

5.6.6. Capacity

Total costs and coverage vary with funding agency and agency of recruitment (measured as funding batch), as described above. Aside from a positive relationship with cost per STI treated, there are no statistically significant relationships between agency of recruitment (funding batch) and average costs. Organisation capacity, as measured by holding of a FCRA certificate, and size do not have statistically significant relationships with total costs, coverage or average costs.

5.6.7. Input prices

The variation in input prices does not manifest itself in statistically significant relationships with average costs (Table 5.16). In fact for the most part, the results are counter to the idea that lower prices should lead to lower average costs as many yield negative test statistics. A scatter plot of the average costs and the prices shows a clustering of data points in one area making it difficult to determine if there is any relationship at all.

5.6.8. Sensitivity analysis

Table 5.17 reports the results of the sensitivity analysis. The positive relationship between total cost and scale holds when extreme values for scale, peer educators'

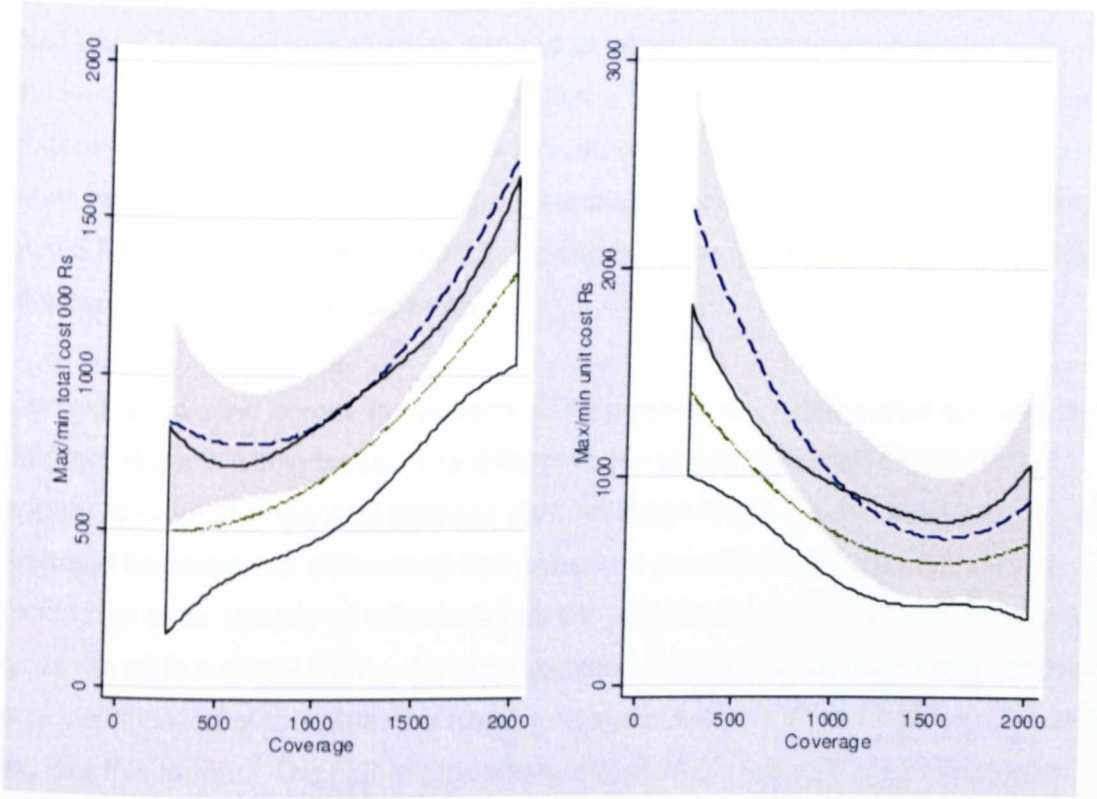
time and prices, project director prices and the cost of STI inputs, educational materials, training and condoms were applied (see section 5.4.2). Furthermore, the non-linear relationship derived in the original analysis is also maintained (see Figure 5.6 and Appendix 14a). Similarly, the non-linear relationship between average costs and coverage holds (see Figure 5.6). However, the results of the analyses for the volume variables do not stand up to the sensitivity analysis. The impact of the sensitivity analyses on the nature of these relationships is shown in the tables in Appendix 14b.

Table 5.17: Sensitivity analysis: the impact of varying assumptions on spearman rank order tests of total costs, cost profiles and average costs relationships with scale

	N	Total cost		Cost profile		Average costs	
		Minimum value	Maximum value	Minimum value	Maximum value	Minimum value	Maximum value
Coverage	15	0.7770*	0.8113*	0.7634*	0.5447*	-0.6225*	-0.7157*
STIs referred	17	0.5686*	0.4853*	0.0184	-0.2280	0.1005	0.0074
STIs treated	14	0.4928*	0.5501*	0.6066*	0.3685	0.1078	-0.0440
Condoms distributed	17	0.5539*	0.5319*	0.2680	-0.0197	0.2917	0.2132
1st contacts with TG	15	0.5679*	0.5107*	0.3029	0.0126	-0.3500	-0.3071
All contacts with TG	11	0.3273	0.3273	0.3425	0.4690	0.2909	0.1909
All contacts	11	0.4727	0.4727	0.4658	0.5104	0.3182	0.2000

* significant at 5%; **significant at 10%; ns = not significant; TG = target group; STIs= Sexually transmitted infections; ^ outliers excluded.

Figure 5.6: Impact of sensitivity analysis on relationship between coverage and total costs and cost per person reached, INR (2003 prices)



			F	*p*	*Adj R-squared*	*Coverage*	*Coverage (sqd)*	*Constant*
Total costs	Max	linear	18.62	0.0006	0.5241	503.3548*		478694.7*
		quadratic	14.45	0.0004	0.627	-629.3748	0.4934*	978004*
	Min	linear	21.29	0.0003	0.5591	485.1739*		244993.5*
		quadratic	11.72	0.001	0.5727	-124.0283	0.2653	513530.9*
Cost per person reached	Max	linear	13.2	0.0025	0.4327	-0.7615*		2019.87*
		quadratic	11.24	0.0012	0.5615	-2.8350*	0.0009*	2933.858*
	Min	linear	8.4	0.0111	0.3161	-0.3963*		1271.451*
		quadratic	6.48	0.0102	0.4064	-1.5137*	0.0005**	1763.994*

* significant at 5%; **significant at 10%

5.7. Discussion

The production cost analysis of targeted HIV prevention projects presented here explores how costs vary across similar projects, with a particular focus on how costs vary with scale. In order to facilitate comparisons of costs with scale of operation, the sampling procedure controls as far as possible for epidemiology, production technology and context. Inevitably, as the sample is taken from an active programme, these factors do vary across the projects. For example, two of the 17 CSW projects provided STI services with their own clinic whereas the remainder referred clients to health care providers to see out treatment. Some projects placed an emphasis on peer educators, where they appeared to be a substitute for staff (eg NGO 8), while in others they acted as a complement to the outreach workers (eg NGO 10). In addition, two truckers'

projects were chosen deliberately to explore the differences in costs between HIV prevention projects for different target groups. It is interesting to note that the median cost per STI treated and condom distributed fall within the same ranges for both truckers' and CSW projects, suggesting that a similar level of efficiency with respect to volume of services is possible across the different target groups. However, given the small sample and limited number of trucker projects and those CSW projects with their own STI services, it is difficult to make generalisations regarding the cost implications of variations in production technology.

Context also varied across the projects. The projects are in two states and located in different districts within these. The differences in states and district level literacy appear to have an impact on average cost, although this is not statistically significant. It should be noted that differences that appear to result from literacy may also be picking up other state-level differences as the projects in districts with the lower literacy rates are all in a single state – Andhra Pradesh. A further analysis of these differences and identification of the causes of lower average costs in Andhra Pradesh is required to explore this further. The higher proportion of costs incurred at the agency level in Tamil Nadu may be one explanation and the higher median number of people reached by the projects in Andhra Pradesh is an important driver of the lower average costs. The reason that the projects in Andhra Pradesh have higher coverage on average are not known and could be attributed to any number of reasons including the population size within the project area and coverage targets set by the providers.

Beyond the production technology and context, it is apparent that the funding agency and contractual history exert an influence on total and average costs. The variation in the roles of the funding agencies is illustrated by the difference in the proportion of total costs that is incurred at the agency level. Further, APSACS contracts out the management and technical support for targeted interventions, whereas the other three funding agencies internalise these roles. The funding agencies' links to the budget and coverage of the NGO projects are through contractual agreements. Statistically significant relationships between both total costs and coverage with budget and funding agency were found supporting this point. Given the statistical significance, the funding agency and budgets appear to be more important drivers of total costs and coverage than the capacity indicators of NGO size and holding a FCRA certificate. However, capacity could also be seen as related to the funding agency. The funding agencies are responsible for selecting those NGOs of relative quality and to bring all NGOs up to a similar level through technical support and monitoring.

The idea that costs fall with project age are raised in a number of cost studies, for example: (Robertson, Hall et al., 1992; Soucat, Levy-Bruhl et al., 1997; Stallworthy and Meekers, 1998; Terris-Prestholt, Kumaranayake et al., 2005a). This increase in efficiency can be attributed to learning and programme maturity (Over, 1986; Stallworthy and Meekers, 1998). On the other hand, increased uptake of services and economies of scale may be responsible (Robertson, Hall et al., 1992; Soucat, Levy-Bruhl et al., 1997; Terris-Prestholt, Kumaranayake et al., 2005a). The analysis here finds no particular relationship of project age with total costs, scale (except STIs referred) or average costs[12] across the full sample. Project age appears to account for some of the variation in the ratio of variable to total costs. The ratio has a positive relationship with age which is logical if coverage is also positively related to age. In a sub-analysis of the Andhra Pradesh projects (results not shown), there is a link, but not statistically significant, between coverage and time since recruitment to the programme. No such pattern was found when looking at cost per person reached, so although coverage may be increasing over time, there do not appear to be any complementary improvements in efficiency. However, data analysis also finds that programme maturity varied with contractual history – i.e. the TNSACS projects had all been in operation for over four years, the CCOORR projects had been active for 1 year, and the age of the APSACS NGOs depended on which agency recruited them into HIV prevention work and the round in which they had been selected. This implies that any relationship between project age with costs or scale may be a result of the different contractual history rather than age itself.

The variation in input prices observed across HIV prevention projects is a phenomenon encountered in other multi-site costing studies, for example, Grieve et al (2001) noted a fifteen fold difference between the highest (Portugal) and lowest (Latvia) cost per hour of European mid grade doctors (Grieve, Dundas et al., 2001), even after adjusting for purchasing power. In the case presented here, peer educator prices vary from INR 200 to INR 9,000 per month; and the average annual cost of outreach workers (or equivalent) ranges from INR 1,200 to INR 5,800. Ranking prices for each category across the NGOs did not yield any particular pattern: no one NGO has consistently higher or lower prices. In addition, there were no significant differences in prices across states or funding agencies. This is manifested in the results of the non-parametric tests, which do not allow us to reject the hypothesis that there is no relationship between prices and total or average costs. Where prices do not vary and it is possible to identify quantities of inputs, some difference in the level of inputs is also

1.

[12] Although cost per STI referred and cost per STI treated have statistically significant relationships with project age, the relationships are in opposite directions which therefore question the validity of the result.

found. For example, although prices are constant, the cost and quantity of educational materials varies with ability to access these materials – larger quantities were available at NGOs with links and access to APAC materials (eg NGOs 6, 16, and 1) and projects that were set up under an agency providing extensive support to the provision and distribution of these types of materials (NGO 12 – a truckers' project). Similar patterns are found with training inputs. Another input that varies without apparent relationship to scale is the condoms used by the project. It was found, through interviews with staff, that the number of condoms used is driven by numbers received by the projects rather than the demand. This, in turn, is driven by supplies available at the local distribution offices and the ability of NGOs to network with other sources of supply such as primary and other health care facilities.

Where technology, context and input prices are similar, cost variations can result from inefficiency (Gilson, 1992; Barnum and Kutzin, 1993b; Creese and Parker, 1994; Fiedler and Day, 1997). It could be argued that that costs may be close to a minimum as the NGOs operate within budgets allocated by funding agencies who are unlikely to over-budget due to their reported distrust of NGOs. However, this is unlikely: the cost variation is not only evident across different coverage levels but also at particular coverage levels, indicating that at the least not all the NGOs are not cost-minimising. Causes of inefficiencies might include staff productivity, prescribing practices, wastage and inappropriate technology. Unfortunately, it was not possible to capture staff productivity, inefficiencies or wastage in the analysis of the projects due to the inability to carry out detailed observations of staff and heath care provider practice. The objectives of the organisation can also affect average costs. It is difficult to assume that organisations are necessarily cost minimising, particularly in public health, where as Mansley at al. (2002) highlight "(the assumption of cost minimization) *may not hold for public health programmes that have no competitive incentive to minimise cost*" (Mansley, Dunet et al., 2002). Ideally the objectives of the organisation and their staff should be analysed in more detail to assess whether this might be a cause of deviation from cost minimising service delivery. NGO corruption was apparent from interviews with NGO staff and funding agencies (see Chapter 7). For example, in areas were local wages are low, it had been the practice of some NGOs to hire staff at rates lower than that which they signed for. Whether the excess went to other project activities, towards the NGO or to line the pockets of the management staff was not clear. It was also not possible to explore these factors and their impact on costs in-depth at the NGO projects. Although greater inefficiency would lead in theory to higher average costs, only one NGO where we had heard rumours of corrupt practices was found to have a relatively higher average cost than the rest of the group.

In examining the different potential causes of cost variation possible within this dataset, it is evident that scale is the most consistent factor in determining the average cost. The importance of scale as an influence on average cost was confirmed by simple regression analysis. The regressions indicate that there is a quadratic relationship between average cost and scale so that there are non-constant returns to scale with average costs beginning to rise beyond a coverage of approximately 1500 CSWs. Although these results are statistically significant, the final sampling procedure may have led to some bias in the regression outputs. The characteristics of the NGOs selected as case studies were marginally different from those in the full sampling frame. In particular, the lower average expenditures and staff numbers implies that the case studies comprised of smaller NGOs, perhaps limiting the possibility of efficient expansion of services and so economies of scale at higher levels of coverage.

In spite of the possible sampling bias with regards to coverage, all scale variables have a statistically significant relationship with their respective average costs (except all contacts). The strength of this relationship compared with the other dimensions can only be determined through multivariate analysis and is not feasible using a case study approach because of the small number of observations. The relationship between the scale variables is less consistent and the analysis found that only 2 of the volume variables (STIs treated and 1st contacts) were significantly associated with service coverage. Reasons for the lack of relationship may include: methods used for recording STI referrals differ such that some projects include repeat referrals, others do not; in the case of condom distribution, the number of condoms distributed is constrained by supply and is therefore less likely to be driven by demand or numbers reached; and the measure of all contacts is unlikely to be related to number of people reached due to the different characteristics of the populations within which the CSWs are living or working i.e. the number of people contacted is more likely to be associated with the local context than the number of people reached by the project. As well as scale, fund batch, project age and input price variables were found to have some influence on cost per STI treated, cost per STI treated/ referred and cost per STI referred/ all contacts with the target group/ all contacts, respectively.

Although budgets are set according to guidelines using a constant average cost per person reached (National AIDS Control Organisation and UNAIDS, 2001), total costs appear to increase and do so at a varying rate as coverage increases. As a result average costs (in terms of coverage) also vary with scale and these relationships hold under the sensitivity analysis. The findings fall in line with a classical 'u' shaped

average cost curve and the regression analysis appears to confirm this. This cost function is not derived from a production function. It is a descriptive cost function due to the data limitations. This makes it more difficult to identify the analysis of causes of change in average cost and to explain the different relationships between costs and coverage and costs volume.

The analysis is limited by the variable quality of the data arising from using a retrospective analysis and routine monitoring systems that were not specifically designed for cost analyses. Inputs to the project in some cases had to be estimated based on interviews with staff rather than actual records. Outputs were taken from routine monitoring systems which are known for mis-reporting and errors and also subject to under or over-reporting depending on the incentives within the system. Financial data were used as a proxy for economic costs for transport and monitoring as no better records were available. Interviews regarding peer educators' and project directors' time and value were subject to bias and false responses. In spite of these problems, one way analysis of uncertainty showed the results to be relatively robust. Although the two way analysis resulted in wide value ranges, these probably over-estimate the error in the monitoring figures. Finally, the small sample compounded by the diversity in the organisations' characteristics limits the ability to allow confident inference from the non-parametric and regression analyses and the interpretation of the results should therefore be made with caution.

5.8. Conclusion

From the case studies, it is clear that scale is a key factor in influencing the average cost and this results in a 'u'-shaped average cost curve. This has crucial implications for planning resources for scaling up. Resource requirement estimation needs to take into account the changing average cost. In addition, it appears that within the range of coverage achieved by these NGOs there is a point of minimum efficient scale. If this is the case, increasing coverage beyond this point will result in increasing average costs. The optimal size of a project will be at the lowest point on the average cost curve and the identification of this optimal level for a given production technology can help in ensuring more efficient use of resources as activities are expanded.

This chapter has presented the results of the costs analyses of 19 case study targeted HIV prevention projects in Southern India. It has identified wide variations in total costs, scale and average costs and that scale is a major factor identified that influences average costs of these NGO projects. From the findings, the paper hypothesises that

the projects are operating with a classic 'u' shaped average costs curve, so that average costs first fall as coverage increases before beginning to rise again with higher levels of coverage. This has important implications for planning the optimal coverage of targeted HIV prevention interventions and improving methods for estimating resource requirements. The following chapter uses econometric techniques to test this cost-output relationship further using this case study data and a larger data set.

Chapter 6. Estimation of a cost function for HIV prevention services for vulnerable groups in Southern India

6.1. Introduction

The analysis in Chapter 5 identified that the cost-output relationship is the main driver behind the cost variations across HIV prevention projects. However, other contextual factors, including contractual history, can also influence total costs. This chapter builds on these previous results and uses econometric techniques to inform NGO contracting policy by:

- Identifying economies of scale in HIV prevention projects targeted at high risk populations for different levels of coverage by estimating marginal costs;
- Identifying whether some point of minimum efficient scale exists in the implementation of targeted HIV prevention projects, if economies of scale are found to exist
- Assessing the impact of other key contextual factors on total and average costs of HIV prevention

The chapter starts with a brief overview of the rationale for the analysis including some background to econometric estimation of cost functions. Next, the datasets collected according to the methods laid out in Chapter 3 are described. The following section lays out the analytical methods used including choice of the model, description of the variables used and the process of the model building. The results are presented in three sections: the descriptive statistics; the choice of best-fit model; and the cost function estimates. The chapter is completed with a discussion of the results and some key conclusions pertaining to this analysis.

6.2. Background

The case study analysis of the production and transaction costs of HIV prevention projects in this thesis suggests three important implications of the expansion of HIV prevention services. First, production costs vary with scale. Second, projects are likely to be able to take advantage of economies of scale when scaling up to a certain level of output. Third, governance arrangements are likely to influence the relative efficiency of projects. Econometric methods can be used to examine the relationship between cost and scale further by estimating the shape of the cost function and hence marginal

costs. Econometric methods estimate cost functions using multivariate analysis to explain how costs vary with level of output. In relating total costs to different output variables, the regression parameters are used to estimate the average and marginal cost, so describing how costs vary with scale of activity (Berndt, 1990). Such statistical cost functions allow the exploration of the impact of scale on costs and the extent of the impact of other factors such as geographical location and governance arrangements, price levels, production technology, timeframe, technical efficiency and range of services provided.

Chapter 2 describes how econometric applications in the estimation of cost functions for health care services have been used to look at issues of efficiency, scale and scope in both high and low income country settings with a focus on the estimation of hospital costs e.g.(Cowing, Holtman et al., 1983; Barnum and Kutzin, 1993a; Aletras, 1997; Weaver and Deolalikar, 2004). These statistical methods are the only way to calculate marginal costs and an index of economies of scale.

In order to isolate the effect of scale on the cost function and marginal costs, an econometric analysis for individual HIV/AIDS projects needs to control for variations in project approaches, prices, epidemiology and the demographic and socio-economic characteristics of the target population. Data focussing on one intervention type, preferably in a single country setting or context are better able to minimise some of the noise generated by these factors. Using economic cost and expenditure information from targeted HIV prevention projects in India, this chapter estimates a cost function for these specific interventions, focussing only on groups with high risk behaviour, and so explores how marginal costs and economies of scale change with the scale of activity.

The chapter has three main hypotheses. First, average costs, and hence marginal costs and economies of scale, vary with scale. Second, there is some minimum efficient point of scale of operation for this type of intervention. And, thirdly, project context, including the age of the project, contractual history, location, prices and funding agency, also influences the average cost.

6.3. Description of the datasets

Two sets of data were used to test empirically the hypotheses. The first comprised the economic cost data from 16 HIV prevention projects for commercial sex workers (CSW) in Tamil Nadu and Andhra Pradesh, analysed in Chapter 5 (one case study was excluded from the analysis of the case study dataset due to missing coverage data, see (Table 5.7, p.139)). The second dataset uses financial data collected from 101

surveyed targeted intervention projects funded by the Andhra Pradesh State AIDS Control Society (APSACS) and managed under contract by the Technical Resource Unit (TRU). Although financial data do not provide as complete a picture as economic cost data, the large sample attainable with the financial dataset allows for more powerful results. They also suggest patterns and the impact of different factors such as scale or target group on the average cost. A summary of the datasets is provided in Table 6.1. The collection of the two datasets is described in Chapter 3.

Table 6.1: Sampling and methods of data collection for the AP financial dataset and case study datasets used in the cost function estimations

	AP financial dataset	*Case studies*
Sample frame	101 NGO HIV prevention projects implementing targeted interventions under contract to APSACS~	40 NGO HIV prevention interventions targeted at commercial sex workers and their clients, contracted by CAPACS*, CCOORR**, APSACS~ and TNSACS#
Sample size	78 projects from the sampling frame. Exclusion criteria related to non response, missing documentation, mis-reporting in outputs and termination of project	16 purposively selected NGO HIV prevention projects based on geographical location, a range of HIV experience and agency knowledge of quality of services
Data collection instruments	Project reported quarterly expenditure statements submitted to and collected from the management agency alongside a postal survey of NGOs to collate information on coverage and organisational characteristics.	Economic cost and coverage data collected using methods based on UNAIDS costing guidelines (UNAIDS, 2000a) during project visits and using routine monitoring records. Costs also include those incurred for technical support, monitoring and contractual management costs at the funding and management agency levels.

*Chennai Corporation AIDS Prevention and Control Society; **Christian Council for Rural Development and Research; ~ Andhra Pradesh State AIDS Control Society; #Tamil Nadu State AIDS Control Society.

The extended analysis of the case studies presented here uses the data on economic costs, output and funding context from the dataset used in Chapter 5. For this first set of data, total cost (C) was defined as the total economic cost including training and other technical and managerial support provided by the funding agencies and the value of volunteer and peer educator time input. The extremely small sample size of the case study dataset is limited in its strength to produce significant results in statistical analysis.

The second and larger dataset was obtained from a combination of the financial records at APSACS' NGO management agency, the TRU, and a postal survey of all the targeted HIV prevention projects. Rather than being limited to CSW projects, this dataset also includes projects targeted at a number of different high risk groups,

namely: CSWs; men who have sex with men (MSM); street children; transgenders; truckers; and slum dwellers. Although all are considered projects for high risk groups, there are some important differences between these project groupings. Firstly, the sizes of the target population within the limited vicinity of the NGO projects are larger and more dynamic in the trucker and slum dweller projects. This results in the projects being able to reach a greater number of people but with less intensity than the smaller and more stable populations of MSM, CSWs, street children and transgenders. Secondly, in the case of MSM projects, APSACS contracts with civil service organisations that have existing networks with the target group. For the remaining target groups, the contracting partners are NGOs that may or may not have existing relationships with the target population.

In the financial dataset, total cost (C) was defined as the annual expenditure of the projects at the project level and excludes the costs incurred by the funding or management agency. These expenditures differ from economic costs in that they include only the resources used for which there is a reported financial transaction and they value those resources at the price used in that transaction. Economic costs include the value of all resources employed to produce the service valued at their opportunity cost.

Of the 101 APSACS projects, complete and feasible observations were obtained from 78. Expenditure reports were not obtained for 8 projects, either because the projects were no longer in operation (n=5) or documentation was missing. All eight of these projects were included in the 19 projects that did not reply to the postal survey. In addition, in 4 cases, coverage variables were in unrealistic ranges relative to the town or district population size, probably a result of mis-reporting or a mistake in data entry. These cases were therefore excluded from the analysis. The sample characteristics of the financial data set are described in Table 6.2. For the case study data they are described in Chapter 5 (see Table 5.3, p.129).

Table 6.2: Characteristics of the HIV prevention projects included in the sample for the econometric modelling, median (range)

	Commercial sex workers	*Slum dwellers*	*Truckers*	*Street children*	*Trans-genders*	*Men who have sex with men*	*Total*
N	17	36	17	5	1	2	78
No. of people reached	1,666	3,874	10,988	6,465	675	5,603	3,901
	(803-3,127)	(993-13,955)	(3,841-24,111)	(3,036-14,871)		(5,206-6,000)	(675-24,111)
HIV project age (years)	3.9	2.3	2.5	3.9	2.1	2.1	2.3
	(2.1-3.9)	(2.1-3.9)	(2.3-5.6)	(2.1-3.9)		No variation	(2.1-5.6)
Organisation age (years)	17.0	16.7	14.3	16.3	12.2	3.2	14.7
	(4.5-27.9)	(6.8-80.1)	(4.7-19.8)	(12.8-33.4)		(2.9-3.6)	(2.9-80.1)
Organisation annual expenditure (INR 000s)	1,831	2,124	2,088	786	2,400	852	1,900
	(225-9,717)	(150-32,403)	(718-105,400)	(500-11,146)		(750-954)	(150-105,400)
Experience working on HIV (years)	4.4	4.3	2.5	5.3	8.6	3.1	4.1
	(2.1-11.6)	(2.1-10.6)	(2.3-13.6)	(3.9-7.6)		(2.9-3.3)	(2.1-103.1)
Holders of FCRA certificate (number)	10	32	14	3	1	0	60

Note: Exchange rate: USD 1 = INR 43.56 (www.oanda.com accessed 14th July, 2005)

6.4. Methods

6.4.1. Model specification

A standard cost function based on economic theory takes the following form:

$C = f(Q, W)$, where C is the total cost of production, Q is output, and W is the set of input prices (Scott and Parkin, 1995).

To ensure theoretical consistency yet still allow for the influence of other explanatory variables beyond output measures, the hybrid functional form developed by Grannemann et al (1986) is adapted here to the single product environment of these HIV prevention projects (Grannemann, Brown et al., 1986). This implies that the cost function is linearly homogenous in input prices (see section 2.7.1.4). For the model used here, total costs are seen to be a function of output, input prices and different characteristics of the projects. It is assumed that the NGOs behave in a cost minimizing way given the constrained budgets available to them.

The equation for the total cost function is therefore:

$$C = e^{a_0 + a_1 W} e^{f(Q, X)} \qquad (1)$$

Where, C = total cost; Q is output of the project, X is a vector of independent variables that shift the cost function and W is a variable representing variations in general price levels across the different project locations.

Only a single price variable was entered into the model due to limitations in the data available and price-setting by APSACS. The prices of the major inputs of personnel, drugs and condoms were set centrally and therefore constant across the projects, eliminating the need to include these prices in the model (Smet, 2002). Where there is input price variation across observations, the implication of excluding prices is to assume there were no input substitution possibilities across the observations (Cowing, Holtman et al., 1983; Aletras, 1997; Smet, 2002). Input substitution across the other inputs in this context (training, building and office expenses, monitoring and evaluation etc) is limited. It was therefore considered valid to exclude all prices except for one representing regional variations in prices of locally purchased goods.

The model has a flexible functional form with linear, squared and cubed variables in output. Taking the log of both sides the equation becomes:

$$\ln C = a_0 + a_1 w + b_1 q + b_2 q^2 + b_3 q^3 + \sum_{i=1}^{j} c_i X_i \quad (2)$$

Coefficient estimates were used to calculate marginal costs and economies of scale. The marginal cost of output is:

$$MC = C(b_1 + 2b_2 q + 3b_3 q^2) \quad (3)$$

Following Weaver (2004) and Barnum and Kutzin (1993) the derived equations for economies of scale are therefore:

$$EOS = \frac{1 - \sigma_{c,k}}{\sum_{i=1}^{j} \sigma_{C,Q_i}} \quad (4)$$

Where EOS is the economies of scale index, $\sigma_{a,b}$ is the elasticity of a with respect to b and k is the capital stock. For this set of cross-sectional data with variations in capital stock that have been controlled for (see 6.5.2, p.181) and a single output, this simplifies to:

$$EOS = \frac{1}{Q(b_1 + 2b_2 q + 3b_3 q^2)} \quad (5)$$

Economies of scale are the gains in efficiency associated with the level of output. If the economies of scale index is greater than one then the level of output is less than the most efficient level. If it is less than one the level of output is greater than the most efficient level of output.

6.4.2. Variables

Table 6.3 describes the variables used in the model. The dependent variable, C (*total cost*), was the total annual expenditure or economic cost of the project, depending on the dataset. Output was defined as coverage (*coverage*) and measured as the number of people reached by the project (see Chapter 3). The range of coverage varies across the two datasets. This is because the case studies focus only on CSW projects whereas the financial dataset includes HIV prevention projects for other target groups

such as mobile workers and truckers with their higher coverage levels. It is important to consider whether output is actually an exogenous variable or if the project is able to decide on the level of coverage it is to achieve. If the producer of services can choose the level of output the regression coefficients will be biased (Smet, 2002). Although the project nominates the target coverage at the outset of each year, this is done in consultation with the funding agency or TRU and is influenced by the size of the target population in the area. In addition, the target is not always met, indicating that the coverage rates are more driven by the size of the population than the projects' plans.

The variable used to reflect location-specific variations in prices was cost of rent (*rent*) to the project. Although, this variable is a line item also used in the summation of total costs, its correlation coefficient with total cost was less than 0.6 (Spearman's $R = 0.5166$, $p<0.001$), indicating the relationship was insufficient to cause major bias in the results.

In addition, a number of contextual factors were likely to influence the nature of the costs. Their relevance to the model was tested by including sets of dummy variables representing the target group *(target group)*, contractual history and location of the project. First, the target groups were split into two major groupings: the "*vulnerable groups*" of commercial sex workers (CSW), street children (SC), trans-genders (TG) and men who have sex with men (MSM) and "*non vulnerable groups*" (but still high risk) of truckers and slum dwellers. As described above, projects for "*vulnerable groups*" tended to be focused on smaller numbers of population and in theory have more intense interaction with the individuals of those groups over time. The "*non vulnerable group*" projects are focused on larger populations that are potentially more dynamic within which it is less easy to have repeated contact with individuals.

Table 6.3: Variables used to represent cost, coverage and prices as well as contextual factors influencing the cost of the projects.

Variable	*Definition*	*Representation in sample (N)*	
		Andhra Pradesh financial dataset (n=78)	*Case studies (n=16)*
Total cost	Total annual cost of the project	Annual expenditure of the project for financial year 2001/02 at the NGO level (Source: expenditure statements submitted to TRU)	Total annual economic cost including training and other managerial support provided by the funding agency as well as the value of volunteer time (Source: economic costing carried out for Chapter 5).
Coverage	Number of people within the target community reached by the project in the year of study	Source: postal survey of all projects	Source: NGO monitoring reports
Rent	Annual rent for buildings paid by the NGO for the project	Annual expenditure on rent by the project for the year 2001/02	Annual equivalent market value of building space used by the project.
Target group	High risk group at which project is targeted	Commercial sex workers (n=17); Men who have sex with men (n=2); Street children (n=4); Transgenders (n=1); Truckers (n=17); Slum populations (n=37)	Commercial sex workers (n=16)
Vulnerable groups	Focus on smaller, relatively static populations allowing for more intensive interactions with the individuals over time	Commercial sex workers (n=17); Men who have sex with men (n=2); Street children (n=4); Transgenders (n=1)	n/a
Non-vulnerable groups	Focus on larger more mobile populations that are still high risk (i.e. warranting the targeted intervention) so that repeat contacts with individuals are less likely	Truckers (n=17); Slum populations (n=37)	n/a
Funding agency (AP financial dataset)	Donor that funded initial recruitment of NGO	Department of International Development (UK) – DFID (n=30); Andhra Pradesh State AIDS Control Society - APSACS (n=48)	n/a
Funding agency (case study dataset)	Donor that is currently funding the project	n/a	Tamil Nadu State AIDS Control Society -TNSACS (n=4); Chennai Corporation AIDS Prevention and Control Society - CAPACS(n=2);Christian Council for Rural Development and Research – CCOORR (n=2); APSACS (n=9)

Table 6.2 (cont.): Variables used to represent cost, coverage and prices as well as contextual factors influencing the cost of the projects.

Variable	*Definition*	*Representation in sample (N)*	
		Andhra Pradesh financial dataset (n=78)	*Case studies (n=16)*
Agency	Agency that managed initial recruitment of NGO and start up of project, grouped by batch of recruitment to programme	APSACS1 (n=22); APSACS2 (n=26); HHP (n=3); SMA1 (n=14); SMA2 (n=13)	n/a
State	Indian state in which project is located	n/a	Andhra Pradesh – AP (n=9); Tamil Nadu – TN (n=7)
Age	No. of years the project has been operating	Source: postal survey of all projects	Source: case study analysis

Note: Unless otherwise stated the source for the Andhra Pradesh financial dataset is TRU records and the source for the case study data is the economic costing for Chapter 5; n/a = not applicable; APSACS1 = Andhra Pradesh State AIDS Control Society NGO recruitment batch 1; APSACS2 = Andhra Pradesh State AIDS Control Society NGO recruitment batch 2; HHP = Department of International Development (UK) funded Healthy Highways Project; SMA1 = Department of International Development (UK) funded State Management Agency NGO recruitment batch 1; SMA2 = Department of International Development (UK) funded State Management Agency NGO recruitment batch 2

Second, contractual history (*funding agency/ agency)*, in the form of the nature of the project start up and investment at this stage, may influence costs. Start up initiatives and the ongoing support in the form of training and support to needs assessment and planning varies across the projects and their funding agencies. The projects are spread out over two states and funded by four different organizations. In addition, within Andhra Pradesh, the management and funding of the projects was merged in 2000 under one organization – the Technical Resource Unit (TRU) contracted by the Andhra Pradesh State AIDS Control Society (APSACS). Previously the projects operated under three different structures - the Healthy Highways Project (HHP) (supported by the UK's Department for International Development (DFID)), the State Management Agency (SMA) (also supported by DFID) and APSACS – with both the SMA and APSACS recruiting NGOs to their programmes in two separate batches as they scaled up activity. The start-up support to the NGOs not only varied across the structures but also with the different phases in which an NGO was recruited to the respective programmes. Variations in start-up can influence costs due to: improved quality and hence efficiency; different levels of relationships with the funding agency potentially leading to variations in budgets; and variations in project design or emphasis. These variations also represent the major differences in capital stock or fixed costs, in the form of investment in training and capacity development, across the NGO projects. It was not possible to measure start up costs due to lack of records. Instead, different sets of dummy variables representing the contracting agency at start-up and the phase in which the NGO was contracted (institutional history) (*agency)*, and the project's funding agency (*funding agency)* were used to capture these variations and so control for differences in capital stock (see Table 6.3). Third, state-level differences in context might influence cost through a variety of institutional, cultural, economic and social factors. A dummy variable reflecting which state the project (*state)* was located in was therefore also included in the model.

Finally, age (*age)* was included in the model as an explanatory variable in the form of years the project had been operable. Age of a project is likely to affect efficiency by lowering average costs through increased learning and skill development. Equally average costs may rise over time as more experienced workers demand higher salaries.

6.4.3. Model building and estimation

The models were run on both sets of data as well as separately for the "*vulnerable*" and "*non-vulnerable*" group targeted project subsets of the larger financial data set. Stata version 8 was used to estimate the models. Total cost was estimated using ordinary

least squares regression. The starting point for the estimation of the model followed equation (2) and took the following form:

$$\ln C = a_0 + a_1 w + b_1 q + b_2 q^2 + b_3 q^3 + c_1 x_1 + c_2 x_2 + c_3 x_3 + c_4 x_4 ,$$

Where ln C is the natural log of total costs,

a_0 is a constant,

w is the price variable proxied by rent,

q is coverage and

x_1, x_2, x_3 and x_4 are vectors of dummy variables representing target group, funding agency, age of the intervention and institutional history.

The model was first estimated with the linear, squared and cubic coverage terms. The regressions with higher order terms in coverage were potentially collinear causing instability in the estimates and some negative values for marginal cost. The mean variance inflation factor (VIF) was used to identify multicollinearity. If the mean VIF for a model is greater than 1, multicollinearity is said to be a problem (StataCorp, 2001). In the cubic models, the mean VIF's were 503.2 and 79.17 for the case study and financial datasets, respectively, causing concern. The joint significance of squared and cubic terms in coverage was then also tested. We found that they were insignificant for both datasets and so finally omitted them from the model. A non-significant result from Ramsey's RESET test on the model for the financial data set indicated that there were no higher order trends and the new specification was correct (H0: the model has no omitted variables: F=0.35, p=0.9056). The results of the Ramsey RESET test for the case studies were more ambiguous (H0: the model has no omitted variables: F=3.95, p =0.0594) but the presence of higher order terms can be rejected at the 95% confidence level.

To select the best fit regression model, the linear version was run with different combinations of the dummy variables listed in Table 6.3. A single variable was omitted based on its significance in the model. Where there was more than one variable or a set of dummy variables, a Wald test was used to test for the joint significance of the variables. Variables were omitted where $p > 0.05$. Finally, the model was run using the direct values and subsequently the natural logs of the variables on the right hand side of the equation. The model with the highest value for the adjusted R^2 was then selected as the best fit.

The estimates were tested for heteroscedasticity using the Cook-Weisberg test, also known as the Breusch-Pagan test. Although heteroscedasticity does not affect the

coefficient estimates, it can cause incorrect inferences about their significance. It was only a problem for the *"vulnerable"* group subset of data for which standard errors were calculated using the Huber-White estimator of variance.

Marginal cost and economies of scale were calculated using equations (3) and (5), respectively, with the predicted value of cost. Given the logarithmic nature of the model, a smearing factor is required to transform the geometric mean of the logged dependent variable to the arithmetic mean of the original variable (Duan, 1983; Manning, 1998; Adam, Evans et al., 2003). For standard regression, the average of the exponential of the residuals is used as the smearing factor so that:

$$E(C) = e^{a_0 + a_1 w} e^{f(X,Q)} e^{mean(resid)} \quad (6)$$

Where robust regression was used to overcome problems of heteroscedasticity, the predicted cost was calculated using equation (7):

$$E(C) = e^{a_0 + a_1 w} e^{f(X,Q)} e^{smear/2}, \quad (7)$$

Where smear is the predicted value generated from a regression of the squared residuals on the independent variables in equation (2) (see (Weaver and Deolalikar, 2004)).

6.5. Results

6.5.1. Descriptive statistics

Table 6.4 and Table 6.5 provide overviews of the two data sets. In the case study data, as described earlier in the thesis (see Chapter 5), there is considerable variation in the mean annual economic cost of the projects across both states (INR 0.61 – 1.2 million) and funding agencies (INR 0.5 – 1.22 million). The same is true for coverage (704-1,523 and 281-1,523, respectively). In addition mean prices, as represented by building rent, also vary from INR 37,779 to INR 57,525 across the two states and from INR 17,468 to INR 58,350 across the funding agencies. These price variations are consistent with the project locations as all Chennai Corporation AIDS Prevention and Control Society's (CAPACS) and APSACS projects are focused in larger towns and cities where prices are expected to be relatively higher than the more rural locations of the offices of CCOORR and TNSACS. There is little variation in the mean project age (7.0 - 7.13 years across the states and 5.5 – 9.0 years across the funding agencies). A correlation matrix of all the variables considered for the model is provided in Appendix 15.

Descriptive statistics for the financial data set reveal variation in the annual expenditures and coverage across both the nature of the target group and the institutional history (see Table 6.5). The difference in mean coverage between target groups (4,290 people reached) relates to the target group classification, as the vulnerable group projects are associated with smaller populations than the non-vulnerable group projects. The different agencies are also associated with specific target groups, resulting, in part, in the variations in coverage across the institutional groupings (from 2,525 to 18,624 people reached). The project age varies with the institutional history as different organisations began contracting NGOs at different times. There is also variation in the rent across both the groupings reflecting price variations across the different settings. Appendix 15 provides the correlation matrices of the variables considered for the models tested for the financial dataset.

Although, the two datasets contain different information in terms of costs, coverage is defined in the same way i.e. number of the target population reached. As expected, the range of coverage in the financial dataset, which comprises a HIV prevention projects for a number of different target groups, is far greater than in the case study dataset. The "*vulnerable group*" subset of the financial data also has a higher mean coverage than the case study data. This could indicate bias in the case study data associated with lower coverage. On the other hand this could also result from the fact that the "*vulnerable group*" classification includes other target groups as well as commercial sex workers.

Table 6.4: Sample means of the annual economic cost, coverage, project age and annual rent paid by state and funding agency, from the economic costing of the case studies, N= 16 (range).

	Total	State		Funding agency			
		Andhra Pradesh	*Tamil Nadu*	*CAPACS**	*CCOORR***	*APSACS*	*TNSACS#*
Annual economic cost, INR	935,307 (446,740)	1,222,151 (439,036)	612,608 (105,230)	726,320 (68,931)	503,776 (41,685)	1,222,151 (439,036)	610,167 (84,761)
No. of people reached	1,165 (608)	1,523 (375)	704 (544)	700 (212)	281 (43)	1,523 (375)	989 (750)
Project age, yrs	7.06 (3.3)	7.00 (3.8)	7.13 (2.9)	9.00 (4.2)	5.50 (0.7)	7.00 (3.8)	7.00 (2.9)
Rent	48,233 (20,460)	57,525 (16,857)	37,779 (19,904)	58,350 (31,608)	17,468 (3,298)	57,525 (16,857)	37,650 (5,529)
Sample size	16	8	8	2	2	8	4

*Chennai Corporation AIDS Prevention and Control Society; **Christian Council for Rural Development and Research; Andhra Pradesh State AIDS Control Society; #Tamil Nadu State AIDS Control Society.

Table 6.5: Sample means of the annual expenditure, coverage, project age and annual rent paid by target group and agency, from the Andhra Pradesh financial data set (N=78) (range)

	Total	Target group*		"Agency": Management agency at recruitment of NGO & batch of recruitment **				
		Non-vulnerable	*Vulnerable*	*APSACS1*	*APSACS2*	*HHP*	*SMA1*	*SMA2*
Total expenditure INR	689,209 (218,835)	663,815 (230,821)	730,734 (180,639)	677,057 (260,118)	639,203 (205,397)	822,238 (315,681)	767,314 (212,904)	694,974 (134,187)
No. of people reached	5,647 (4,742)	6,809 (4,870)	2,519 (3,076)	6,942 (3,971)	6,064 (4025)	18,624 (4980)	3,479 (3,454)	2,525 (2,190)
Project age, yrs	2.72 (0.8552)	2.60 (0.7934)	2.96 (0.9398)	2.5 (0)	2.25 (0)	5.59 (0)	3.92 (0)	2.08 (0)
Rent, INR	48,480 (14,130)	44,937 (13,010)	56,452 (13,513)	44,542 (15,888)	45,057 (9,878)	48,699 (21,191)	56,164 (15,184)	53,664 (12,638)
Sample size	78	54	23***	22	26	3	14	13

*"Vulnerable group" projects include those for commercial sex workers (CSW), street children (SC), transgenders (TG) and men who have sex with men (MSM); "Non vulnerable group" projects are those for truckers, mobile populations and slum dwellers. ** Prior to 2001, the targeted interventions were funded and managed by 3 different projects – Andhra Pradesh State AIDS Control Society (APSACS); Department for International Development UK (DFID) supported Healthy Highways Project (HHP); and the DFID supported State Management Agency (SMA). The dummies represent these 3 different projects and that both APSACS and SMA recruited NGOs in 2 separate batches. *** One further extreme value dropped.

6.5.2. Identifying the best-fit model

The final model specifications that were used were as follows:

AP financial dataset:

$\ln C = a_0 + a_1 \ln w + b_1 q + c_1 x_1$, where x_1 is a dummy variable representing vulnerable group interventions (non-vulnerable group being the excluded category).

AP "vulnerable group" only sub-dataset:

$\ln C = a_0 + a_1 \ln w + b_1 q + \sum c_n x_n$, where n=1-3 and x_n represents a dummy variable for the target group of the interventions (men who have sex with men, transgenders and street children with commercial sex workers being the excluded category)

AP "non-vulnerable group" only sub-dataset:

$\ln C = a_0 + a_1 \ln(price) + b_1 q + c_1 x_1$ where x_1 is a dummy variable representing trucker interventions (slum dweller interventions being the excluded category)

Case study dataset:

$\ln C = a_0 + a_1 \ln w + b_1 q + c_1 x_1$ where x_1 is a dummy variable representing the state of Tamil Nadu (Andhra Pradesh being the excluded category).

The results of the rejected model specifications are summarized in Table 6.6. For the financial dataset and its subsets, the target group was the only additional factor beyond price and coverage found to influence the total cost function. The variables representing funding agency and institutional history did not improve the model, nor were they significant. Assuming that these variables are a good indicator of the variation in start up costs, it was therefore concluded that start up costs had little influence on variable costs. As all projects were implemented within a recurrent budget with minimal capital investment beyond training and other costs incurred at the agency level, no further control for capital stock was considered to be required. For the case studies, the state in which the project was located was identified to be the only other factor influencing the cost function significantly. In addition, a better fit model was

obtained with the direct values of price rather than their natural log. However, to facilitate comparability with the analysis of the AP financial dataset and as F tests on both specifications resulted in over 99% confidence, the natural log of the price variable was used.

Table 6.6: Summary of results from theoretically feasible models tested, excluding the best-fit models*

Model	*Adj R^2*	*Exploratory tests/ notes*
Full sample		
Price enters directly (not ln)	0.2750	F=10.73, p <0.0001
All terms entered as natural logs	0.4129	F=18.58, p <0.0001
Cubic	0.4561	Mean VIF** =79.17; Joint test on sq & cubic terms: Prob>F=0.3598
Additional dummies		
Funding agency	0.4548	Joint test on dummies: p = 0.0724
Age	0.4553	Joint test on dummies: p = 0.0698
Agency	0.4426	Joint test on dummies: p = 0.252
Alternative dummies		
Funding agency	0.4486	
Target group	0.4631	Joint test on dummies: Prob > F = 0.1178
Age	0.4304	
Agency	0.4486	Joint test on dummies: p = 0.1722
Target group and Funding agency	0.4616	Joint test on dummies: p = 0.1422
Target group and Age	0.4571	Joint test on dummies: p = 0.1692
Agency and Age	0.4486	Joint test on dummies: p = 0.1722
Vulnerable groups only		
Price enters directly (not ln)	0.5274	F = 6.13, p = 0.0017
All terms entered as natural logs	0.5384	F = 6.36, p = 0.0014
Cubic	0.4712	Mean VIF = 367.16; Joint test on sq & cubic terms: p=0.5092
Additional dummies		
Age	0.4282	Joint test on dummies: p = 0.3779
Agency	0.4282	Joint test on dummies: p = 0.3779
Alternative dummies		
No dummy	0.4708	
Agency and Age	0.4451	(Age is dropped from the model)
"Non vulnerable" groups		
Price enters directly (not ln)	0.2216	F = 6.03, p = 0.0014
All terms entered as natural logs	0.3678	F=10.89, p<0.0001
Cubic	0.3801	Mean VIF=133.82; Joint test on sq & cubic terms: p=0.6918
Additional dummies		
Age	0.3935	Joint test on dummies: p = 0.5341
Agency	0.3912	Joint test on dummies: p = 0.7998
Alternative dummies		
No dummy	0.4025	
Age	0.3999	
Agency	0.3968	Joint test on dummies: p = 0.3467
Agency and Age	0.3968	Joint test on dummies: p = 0.3468

Table 6.5 (cont.): Summary of results from theoretically feasible models tested, excluding the best-fit models*

Model	*Adj R^2*	*Exploratory tests/ notes*
Case studies		
Price enters directly (not as natural log)	0.8041	F=21.53, p < 0.0001
All terms entered as natural logs	0.7316	F=14.63, p = 0.0003
Cubic	0.7793	Mean VIF=503.02; Joint test on sq & cubic terms: p=0.1336
Additional dummies		
Age	0.7764	Joint test on dummies: p = 0.1737
Agency	0.7887	Joint test on dummies: p = 0.1799
Alternative dummies		
No dummy	0.7399	
Age	0.7212	
Agency	0.7887	Joint test on dummies: p = 0.1799
Agency and Age	0.7739	Joint test on dummies: p = 0.2838

* The F statistic on all models is significant at the 95% confidence level; **Variance inflation factor

6.5.3. Cost function estimates

6.5.3.1. Goodness of fit

The results from the best fit regressions for each of the datasets and sub-datasets are presented in Table 6.7. For the full AP financial dataset, the adjusted R^2 is 0.4622 and the F statistic is significant at 99% confidence (F=22.48, p <0.001). The adjusted R^2 indicates a slightly worse fit for the non-vulnerable group sub-dataset (R^2= 0.3983), although this was still significant at 99% (F=12.25, p<0.001). The model specification for the vulnerable group sub-dataset was heteroscedastic and therefore re-estimated with robust regression with Huber-White standard errors. The robust regression estimated the model as having a better fit for the vulnerable group dataset than for the financial data set as a whole (R^2=0.5714; F=27.67, p < 0.0001).

The model specification for the case study dataset also resulted in a good fit (adjusted R^2 = 0.7891), with a surprisingly strong significance on the F test, given the small sample size (F= 19.71, p < 0.001).

6.5.3.2. Relationship between coverage and total costs

For each model, the coefficient on coverage is statistically significant but varies across the datasets. The coefficients on coverage are statistically less significant for the case study model (p=0.018), the vulnerable (p=0.087) and non-vulnerable (p= 0.028) group sub-data sets than the AP financial dataset as a whole (p<0.001). This decrease in confidence may be in part due to the smaller sample sizes. The variation in the coefficients on coverage indicates that the relative impact of scale on costs varies across the datasets. In the case study data set there is a 0.03% change in total cost

for each extra person reached compared with a 0.002% change in the financial dataset.

Table 6.7: Cost function estimates

Variable	*AP financial data*		*Vulnerable group only subset^*		*Non-vulnerable group subset*		*Case studies*	
	Coefficient	*Standard error*	*Coefficient*	*Standard error*	*Coefficient*	*Standard error*	*Coefficient*	*Standard error*
Constant	8.053843*	0.909046	6.3453*	1.151039	8.375346*	1.160293	11.55254*	0.718119
Ln(price)	0.4827907*	0.0849852	0.65001*	0.10827	0.4531924*	0.10827	0.1729654**	0.0627868
Coverage	$2.01x10^{-5}$ *	$4.52x10^{-6}$	$3.61\ x10^{-5}$ ***	$1.99x10^{-5}$	$1.67\ x10^{-5}$ **	7.3410^{-6}	0.000347**	0.000127
Vulnerable group	0.1143**	0.04873						
Men who have sex with men			-0.3516*	0.08931				
Street children			-0.1064	0.0943				
Transgenders			0.029474	0.042824				
Truckers					0.06093	0.07543		
Tamil Nadu							-0.2801**	0.12508
N	76[§]		23[¥]		52		16	
F	22.48*		27.67*		12.25*		19.71*	
Adjusted R^2	0.4622		0.5714[¥]		0.3983		0.7891	
Test for heteroscedasticity ($\chi^2(1)$)	5.81**		2.00		8.89*		3.29***	
Additional tests			Jt test on dummies: F=9.02*					

*significant at 99%; **significant at 95%; ***significant at 90%; [§] Two cases are dropped as rent = 0 ; [¥] one further outlier dropped; ^Robust regression with Huber-White standard errors; [¥] not adjusted

6.5.3.3. Marginal costs

The difference in the coefficients on coverage, combined with the different ranges of coverage included in each dataset, translate into variations in the value of marginal cost i.e. the slope of the total cost curve. These differences are reported in Table 6.8. The marginal cost at the median level of coverage in the case study dataset is over 25 times the equivalent value for the financial dataset. The higher value of the marginal costs in the case study data is likely to be attributable to the different shape of the cost function as well as the nature of the data, as these data also include the costs incurred at the funding and management agency level associated with training, monitoring and evaluation and contractual management. Analysis of the subsets of the financial data show marginal costs of the vulnerable group are higher on average than for the non-vulnerable group.

Table 6.8: Predicted marginal and average costs (Indian Rupees (INR)) and economies of scale index at the median and interquartile range's values of coverage

Sample	AP financial data	Vulnerable group only subset	Non vulnerable group subset	Case studies
Marginal cost, INR				
Median	14.26	25.48	9.97	227.06
25th percentile	13.00	23.71	10.84	334.58
75th percentile	15.40	19.74	12.27	450.01
Average cost, INR				
Median	161.43	333.42	128.02	824.28
25th percentile	305.64	495.98	173.42	769.60
75th percentile	107.94	187.38	72.40	766.93
Economies of scale index				
Median	21.29	19.61	17.38	3.39
25th percentile	12.40	14.06	11.82	2.48
75th percentile	7.01	9.51	5.90	1.71

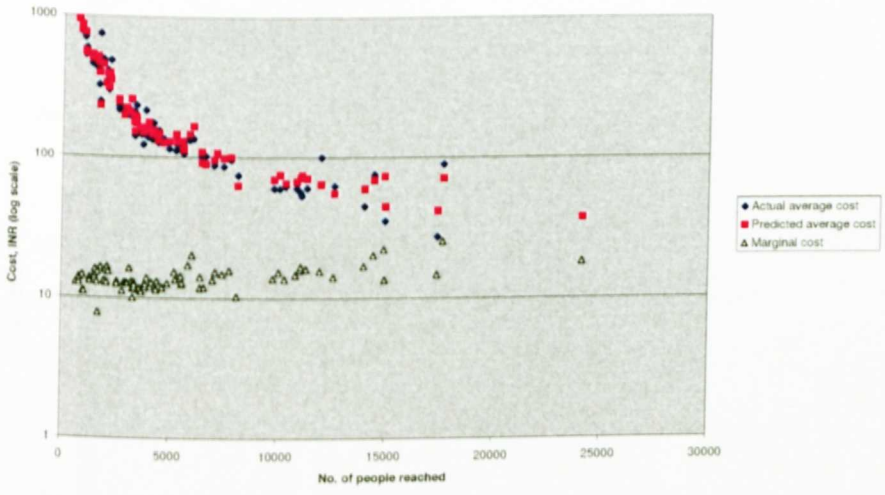
In addition to differences across the datasets, Table 6.8 shows how for each dataset the marginal cost varies across levels of coverage within each dataset. For the financial dataset (median coverage = 3,927) the marginal costs are INR 14.26, INR 13 and INR 15.4 at the median, 25th percentile and 75th percentile of coverage, respectively (see Table 6.8), indicating that marginal costs first fall and then rise with increases in coverage. The relationship between marginal cost and coverage also varies across the subsets of the financial dataset. Marginal cost falls from INR 23.71 at the 25th percentile of coverage to INR 19.74 at the 75th percentile for the vulnerable group subset (median coverage = 1970), whereas it rises from INR 10.84 at the 25th percentile to INR12.27 at the 75th percentile of coverage for the non-vulnerable group subset (median coverage = 5071).

The plots of predicted marginal costs against coverage for the financial dataset and its subsets are given in Figure 6.1. They indicate that marginal costs increase over the range of coverage for the entire sample and the non-vulnerable group subset. Over the narrower range of coverage reached by the vulnerable group projects, the marginal costs appear to remain relatively constant.

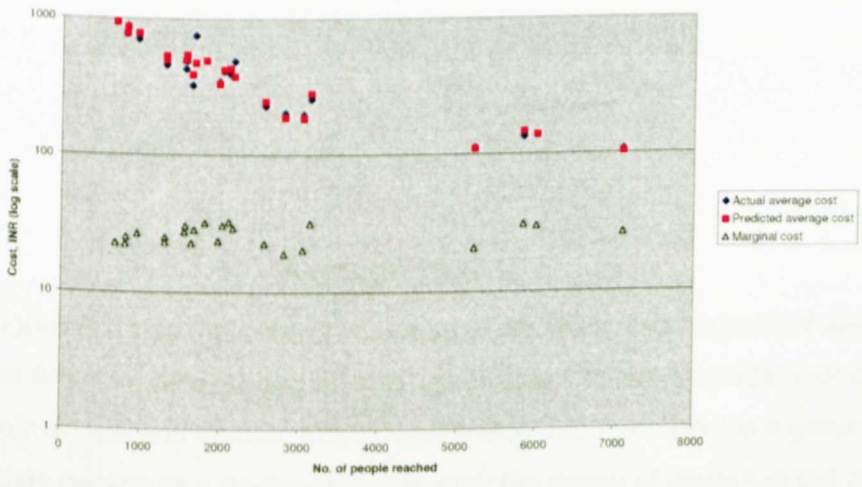
For the case studies (median coverage = 1,174 people reached), the marginal cost falls and then rises as coverage increases with the marginal cost being INR 334, INR 227 and INR 450 at the 25th percentile, median and 75th percentile of coverage, respectively (see Table 6.8 and Figure 6.2).

Figure 6.1: Average and marginal cost, INR, for the AP financial dataset.

a. All sample



b. Vulnerable group only



c. Non-vulnerable group

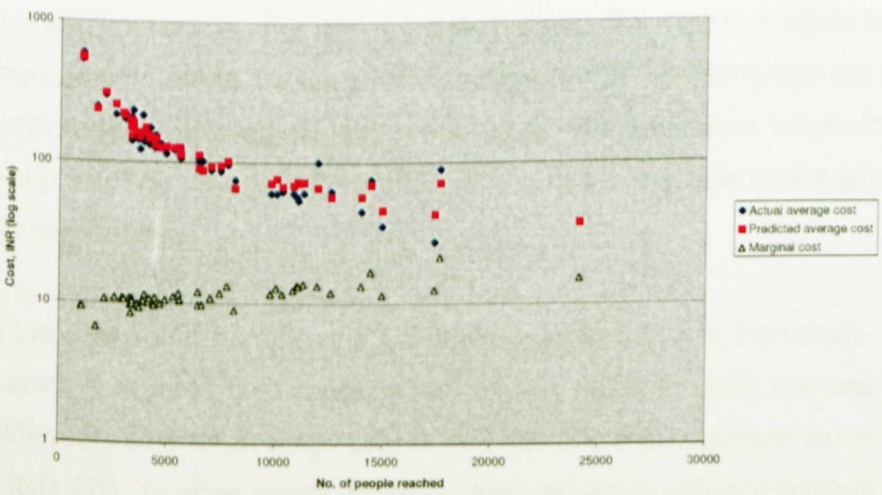
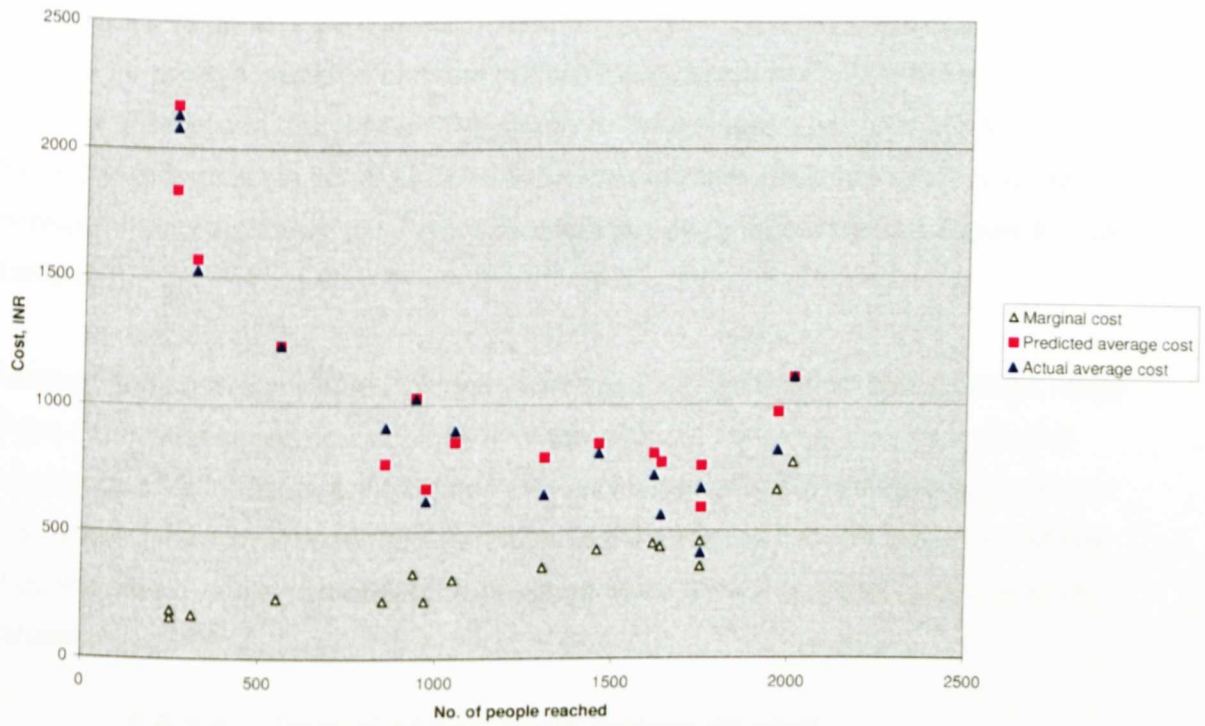


Figure 6.2: Predicted marginal and average cost, INR for the case study data



6.5.3.4. Average cost

Figure 6.1 also describes the shape of the predicted and actual average cost curves for the financial dataset and its subsets of data. These average cost curves are close in both shape and values, further confirming that the model is a good fit. The average costs decline at a decreasing rate over the range of coverage but do not reach a minimum for any of the financial datasets. Nor does the marginal cost curve cross the average cost curve. For the complete dataset, the minimum value for the predicted average cost within the range of coverage is INR 37.4, whereas the maximum value predicted for the marginal cost is INR 25.4. The equivalent values for the vulnerable group are INR 33 and INR 104 and for the non-vulnerable group are INR 21 and INR 37, respectively.

In the case study sample, the average cost first falls and then rises. Again the predicted average cost curve compares well with the actual average cost curve. The minimum value for average cost is INR 594 and the maximum value for marginal cost is INR 770. In other words, there is some minimum efficient scale of operation for commercial sex worker projects, at around 1750 people reached.

6.5.3.5. Economies of scale

The index for economies of scale is greater than 1 for all the datasets across the interquartile range of coverage (see Table 6.8). This means there are economies of scale to be taken advantage of in the project implementation that are not exhausted over the observed output range. The shape of the average cost curve and the fall in the economies of scale index as coverage increases also suggest that as coverage increases the projects are moving towards greater scale efficiency (see Figure 6.1 and Table 6.8).

Although the coverage range included in the case studies is within the coverage range of the financial dataset, an examination of the predicted average cost curve for the case study data in Figure 6.2 indicates that economies of scale are exhausted within this range. However, due to the differences in the nature of the cost data, the indices of economies of scale cannot be compared between the AP financial and case study datasets.

6.5.3.6. Impact of non-scale factors on cost

The regression analyses also show that the case study costs vary with location and the target group. For the case studies, the coefficient on the state dummy is negative and significant (p=0.045), implying that project costs are 28% lower in Tamil Nadu than Andhra Pradesh.

In the analyses of the AP financial dataset and its subset, including the target group dummies provides for better fit models than if these variables were excluded (see Table 6.6). The coefficient on vulnerable group is significant at 95% (p=0.0220), indicating that the vulnerable group interventions are 11% higher in total cost than the "non-vulnerable" group interventions, a finding supported by the sub-dataset analysis of economies of scale and average cost, above.

Of the dummies for target group in the vulnerable group dataset only the coefficient on men who have sex with men is significant. The coefficients on the dummies suggest that the interventions for men who have sex with men and for street children are lower cost (35% (p = 0.001) and 11% (p = 0.275), respectively) than those for commercial sex workers. Finally, the "non-vulnerable" group trucker projects are 6% higher in total cost than the slum dweller projects, although this is not significant (p = 0.423).

Price also has a positive and significant relationship with total cost across the datasets and sub datasets. The cost elasticity is 0.17 for the case study data set (p = 0.017) and

0.48 for the financial data set ($p < 0.001$). Costs are therefore price inelastic so that in the financial dataset a 1% increase in price leads to a rise in costs of 0.48%.

6.6. Discussion

The econometric analysis presented here has used two different sets of data to explore how the costs of HIV prevention interventions change with coverage and the potential influence of other contextual factors on the cost function. The extension of the case study cost analysis allowed the exploration of hypotheses developed earlier in the thesis. At the same time, the larger sample permitted a more powerful analysis of the question of scale and, therefore, also the influence of the nature of the target group and other contextual factors, including contractual history, on costs. Results generated from the two sets of data are similar, supporting the findings of Chapter 5 that average costs change with scale of operation and that at low levels of coverage there are scale efficiencies to be exploited. At higher levels of coverage, the model based on the financial dataset finds that these economies of scale are not exhausted, whereas the model based on the case study data identifies a point of minimum efficient scale beyond which average costs start to rise again.

The findings also suggest that variations both in price levels and the target group are key factors in shaping cost whereas the influence of funding source, age of the project, and institutional history were found to have no significant influence. In other words, there are differences in costs across the targeted interventions associated with scale, local prices and target group variations. The design of contracts for implementing these projects needs to take account of these variations.

Differences between the target groups are an important influence on cost, changing the intercept in the relationship between cost and coverage. The difference in costs associated with the respective dummy variable is therefore linked to the level of fixed costs of the project. Including the dummy variable that classifies the projects between the major target group groupings in the model revealed that the total cost of vulnerable group projects was on average 11% higher than for the non-vulnerable group. One reason for this is that it is likely to be harder to reach the more isolated and marginalized groups requiring greater investment in building trust with the target community at the start of the project. Similarly, the lower cost of the MSM projects relative to CSW projects (35%) may be a result of institutional structure that affects the ease of access to the respective population groups. These projects are contracted out to civil society organizations which derive from existing MSM networks rather than NGOs that are normally recruited for the targeted interventions and often have no prior

experience of the vulnerable groups they are contracted to work with. A more complex econometric model would be required to evaluate whether there are changes in marginal cost too and this has not been explored here.

In the analysis of the case studies in Chapter 5, funding agency was found to be an important factor influencing average costs. Here, the model including funding agency was rejected as not the best fit model (Adjusted $R^2 = 0.7887$, $p < 0.001$). However, using this rejected model on the case study data i.e. with the agency dummy variables while excluding the state dummy variable, finds that the total costs of the TNSACS and CAPACS projects are 54% ($p = 0.021$) and 47% ($p = 0.043$) less than the APSACS projects, respectively. This confirms that there is a major difference in the production costs between the funding agencies.

Although these data represent the first of their kind in HIV prevention, in terms of standardized datasets in a single country setting, they do have limitations. The quality of the case study data has been discussed elsewhere (see Chapter 5). The financial dataset is subject to the flaws of much accounting cost data including mis-reporting and false claims. This is most likely to affect the proportion of spending on individual line items rather than total cost as projects are likely to adhere to the overall budget. In both cases the datasets are cross-sectional, excluding any possible time effects on the cost from the model e.g. lagged cost or lagged coverage, and leading to a possible bias in results. However, longitudinal data were not available as a result of the organizational changes that the programme had undergone.

A further limitation relates to the budgetary guidelines for targeted interventions issued by the National AIDS Control Programme. These budgetary guidelines, which were under revision at the time of completing the fieldwork, provide the State AIDS Societies and their contractual partner with advice on the types and number of personnel and activities a project should include and the budgetary allocation for each of these items. They also provide an estimated average cost per target group member reached to enable planning at the state and national levels (National AIDS Control Organisation, 2000a). Guidelines for the budget setting process can restrict flexibility. As a result costs may in fact be deterministic. If this is the case, it could be argued that a stochastic method for deriving marginal cost is in fact inappropriate. However, the state AIDS control societies were established to allow for flexible management and to recognise that the design of targeted projects depends "*on the context and environment in which the vulnerable population lives*" (YouandAIDS: the HIV/AIDS portal for South and North-East Asia, 2002a). Furthermore, in Andhra Pradesh the

budget setting process involves consultation with the NGO and consideration of the project activities in previous years and, in both states, the individual budgets granted bear little resemblance to the budget guidelines (see Chapter 5). Therefore it is believed that there is sufficient variation among projects to warrant the econometric approach.

The results from the financial and case study datasets are striking for both their similarities and differences. In spite of the differences in the nature of the data and how they were collected, the best fit functional form is almost identical across the two datasets. However, there is a major variation in the results generated from the two datasets in the form of the relative difference between the measures of marginal cost. The difference in the coefficients on coverage in the regressions, i.e. the proportionate change in cost associated with an additional person reached, results in the steeper marginal cost curve generated from the case study data. This difference in the slopes of the marginal cost curves could arise from a number of different factors. First, the range of coverage in the financial dataset (675-24,111 people reached) is far greater than in the case study dataset (250-2008 CSWs reached). However, the case study dataset's range of coverage falls within that of the financial dataset. In effect these data represent a subset of the vulnerable group subset of the financial dataset, rather than a different interval along the total cost curve.

Second, there are differences in the variable definitions across the datasets. The financial dataset includes expenditures as reported by the NGOs to the TRU and therefore does not include inputs made at other levels of the targeted intervention programme or any inputs that are not provided for under the APSACS NGO budget. The economic costing used in the case studies incorporates the value of volunteer time, the value of all inputs no matter the funding source and the inputs of training, monitoring and supervision and management made by the funding or management agency. As they reach the limit of their capacity, it is likely that it is these largely fixed costs, associated with infrastructure and development, which lead to the rising average costs at larger scales of coverage seen in the case study data. This has important implications for the marginal cost and whether a project is able to continue to take advantage of economies of scale as coverage increases. The higher average costs may also reflect the fact it is harder to reach more CSWs beyond the limit of the population within a specific geographical location.

Third, the difference in definitions may imply that the functional form for the case studies does not in fact coincide with that for the datasets. The more ambiguous

results of the Ramsey RESET test indicate that it is possible that either higher order terms or interactions of the dummies with output have been omitted from the model. However, persistent problems with multi-collinearity across linear, squared and cubic terms do not permit stable estimation of the model with higher order terms and the small sample sizes do not allow for the large numbers of explanatory variables required for the interaction of terms.

There are no studies of the impact of scale on the costs of targeted interventions with which to compare the results presented here. Work carried out by Kumaranayake et al (2000) using cost data from a range of HIV/AIDS prevention and care programmes find a 'u'-shaped average cost curve and that projects are likely to encounter diseconomies of scale arising from infrastructural barriers as coverage increases (Kumaranayake and Watts, 2000d). On the other hand, results from the larger financial dataset presented here suggest that there are continuing economies of scale with increases in coverage. The analyses of the case study data, however, serve to reinforce the more general findings of a U shaped average cost curve and identify a point of minimum efficient scale. This contrast in findings regarding scale of the projects between the two datasets and the confirmation of the influence of contextual factors, including price and target group variation, underline the importance of using full economic costing and an understanding of a project's context, in the analysis of cost functions, estimating resource requirements and for planning and contract design.

6.7. Conclusion

This chapter has presented the estimation of a cost function for HIV prevention services using two data sets. The analysis is based on techniques used for the estimation of hospital cost functions allowing for a flexible functional form. The findings indicate that there are economies of scale to be exploited as coverage of the projects is increased. The case study dataset of commercial sex worker interventions identifies a point of minimum efficient scale, beyond which average costs begin to increase, whereas the financial dataset suggest that average costs continue to fall at a decreasing rate over the range of coverage for the entire set of projects reaching the different high risk groups. The results also show that not only is scale important in influencing average cost but so are local price variations and the nature of the target group the project is focusing on. The combination of a large standardized data set and econometric techniques has provided for greater insights into how costs change with coverage and the key factors that influence the total costs of targeted HIV prevention services. The analysis demonstrates the importance of understanding the nature of the cost function in designing project contracts, selecting efficient levels of coverage for

these projects, constructing their respective budgets and for estimating resource requirements for scaling up coverage of HIV prevention projects.

Chapter 7. Transaction cost analysis of contracting out HIV prevention services to NGOs in Southern India

7.1. Introduction

An understanding of both production costs and transaction costs is required to assess gains or losses in efficiency associated with a particular strategy for delivering HIV prevention services. Chapters 5 and 6 have explored the production costs of HIV prevention services for high risk groups in Southern India. The mapping analysis (Chapter 4) identified a range of different governance arrangements for scaling up HIV prevention services in Southern India. In order to understand the economic implications of these different approaches, the objective of this chapter is to identify and analyse the transaction costs of different governance arrangements for scaling up targeted HIV prevention projects by contracting with NGOs in three Government of India supported programmes in Southern India.

7.2. Background

The governance of health service contracts, in the form of the processes and systems with which they are managed, is likely to have an important influence on their costs and effectiveness. Government contracting for health services is increasing throughout the developing world as a mechanism to increase efficiency and coverage (Oliveira-Cruz, Hanson et al., 2003; Liu, Hotchkiss et al., 2004; Loevinsohn and Harding, 2004; Loevinsohn and Harding, 2005).

The rationale for the contracting out of HIV prevention services in India arises in part from the size of the problem:

"It has been acknowledged by NACO (National AIDS Control Organisation) that NGOs (Non-Governmental Organisations) ... are necessary and complementary actors on this stage, as this is beyond the realm of either the Union or State Governments to consider tackling this problem alone", National AIDS Control Programme (NACP) Country Scenario Update (December 1995, p34) cited in (National AIDS Control Organisation, Undated-a).

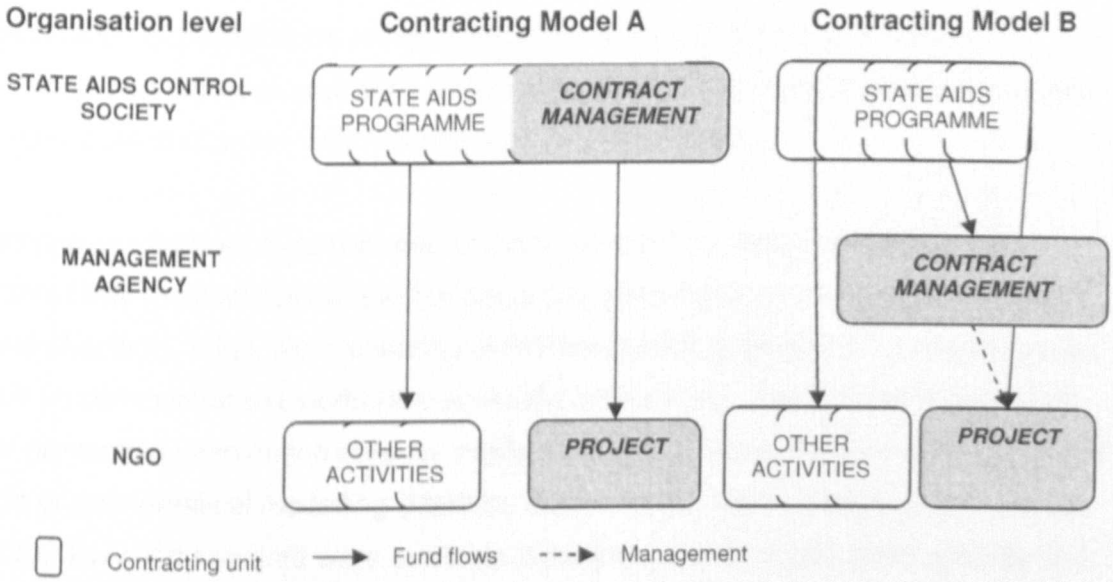
In addition, it forms part of a move by the Government of India (GOI) and donor community towards New Public Management initiatives in the health sector which

involve moving away from the bureaucratic models of activity and expenditure control inherited from a colonial era (Bennett and Muraleedharan, 2000). Delivery by the government health system implies the characteristic internalisation of decision-making in the form of bureaucratic employment, controls and planning. According to Williamson's framework (see Chapter 2), this is a transaction cost minimising solution to governance of exchange where bounded rationality makes contract specification difficult; and relational contracting is undermined by the combination of asset specificity and opportunism. However, in India, the extent of central control in the health sector has been shown to have slowed decision-making and action (Bennett and Muraleedharan, 2000) and often resulted in failures in either the system to deliver as planned or policy that did not meet need (Das Gupta, Khaleghian et al., 2003; Varatharajan, 2003). In spite of a concern regarding the limited capacity of government to manage contracts (Bennett and Mills, 1998), evaluations of such initiatives in Cambodia, Bangladesh and Central America have shown positive results in terms of improved equity, efficiency and transparency (Abramson, 2000; Abramson, 2001; Bhushan, Keller et al., 2002; Loevinsohn, 2002; Jack, 2003; Soeters and Griffiths, 2003; Loevinsohn and Harding, 2005). In their analysis of contracting with NGOs for HIV/AIDS services in Brazil and Guatemala, Barnett et al. (2001) found increased security, the improved accountability, speed and coordination as the four main reasons for contracting with NGOs within in the national HIV/AIDS strategy (Barnett, Connor et al., 2001).

Targeted interventions (TIs) are perceived as the most effective strategy for halting the spread of the HIV/AIDS epidemic in its nascent stage (World Bank, 1997). The Government of India has chosen to scale up these targeted HIV prevention efforts by contracting out services to NGOs, where little HIV/AIDS related activity existed before (Bennett and Muraleedharan, 2000). NGOs are seen as particularly appropriate for accessing high risk groups who are most likely to be marginalised and least able to access public health services (Solomon, Chakraborty et al., 2004). As described in Chapter 4, the central government has decentralised the HIV/AIDS programme to the state, and in some cases municipal level, and implementation to corresponding State or Municipal AIDS Control Societies (SACS/ MACS). The SACS are then responsible for contracting NGOs to implement the targeted HIV prevention projects according to a set of guidelines issued by the National AIDS Control Organisation (NACO) (National AIDS Control Organisation, 2004b). However, the combination of the SACS' autonomy and presence of different donors in each state has led to the evolution of at least three contracting models for HIV prevention services (see Chapter 4). Two of these are implemented with funds channelled through the SACS: direct contracting by the SACS

(the national model); and employment of an intermediary to recruit, manage, monitor, evaluate and provide technical support to the NGOs (the DFID model) (see Figure 7.1) on behalf of the SACS. The USAID model is not considered here having been dropped from the sample (see Chapter 3).

Figure 7.1: Contractual units within the organizational structure for the national (contract model A) and DFID (contract model B) models of delivery of NGO targeted HIV prevention projects in India.



Scaling up, from the SACS perspective, entails increasing coverage of the target group either through expansion of target group coverage by a project within a limited geographical setting or replicating projects in new geographical areas. As each project is dependent on close ties with a particular community, it is perceived to have certain geographical limits. Consequently, to reach the next community(ies), the SACS need to increase the number of projects by recruiting new NGOs or contracting an existing contractual partner to establish an additional project(s). By 2004, the National AIDS Control Programme had established 993 contracts NGOs for the delivery of these HIV prevention projects (National AIDS Control Organisation, 2004a). In spite of these large numbers and variations in contracting models across states and different funding sources, there has been no analysis of the contracting models to identify the most effective mechanism for managing the NGO contracts.

7.3. Theoretical framework

As Chapter 2 describes, transaction costs are defined as the costs of friction in the contracting process (Williamson, 1983). Transaction costs and associated governance are shaped by the presence or not of bounded rationality and uncertainty;

opportunism and asset specificity. The frequency of the transaction and the institutional environment also serve to further influence the transaction costs (Williamson, 1983; Williamson, 1996; Ashton, 1998; Palmer, 2000; Allen, 2002). Assuming profit-maximisation, different organisational structures are established to minimise the transaction costs (Williamson, 1983). Where transactions are costless governance by the market and discrete spot contracts would be expected (as assumed in the neoclassical model). As the cost of transactions rises, incentives to remove the transactions from the market are created. With this move towards the internal organisation of transactions or hierarchical governance, the role of the price mechanism in resource allocation is reduced and the organisation itself becomes the locus of control (Coase, 1937; Alchian and Demsetz, 1972).

Applying this framework to the case of HIV prevention in India, there are five key factors likely to affect the transaction costs and governance of contracts at increased scale of activity. First, the monitoring of HIV prevention projects for vulnerable groups such as commercial sex workers is unusually problematic. Data on the impact of an HIV prevention intervention is rarely available as it requires expensive epidemiological trials or mathematical modelling (Merson, Dayton et al., 2000; Grassly, Garnett et al., 2002). Even if these data were available the impact would be difficult to attribute to a specific project given the dynamics of the target populations and their sexual partners and the possible presence of other HIV prevention activities in the same locality. Equally, monitoring of projects that depend on the NGO's close relationship with the target community can be undermined if access to the population is therefore controlled by the NGO. Second, as scale increases, in the form of numbers of contracts, monitoring becomes more difficult due to the increased volume of activity. This compounds the problems of bounded rationality and other information problems, opening up possibilities for opportunistic behaviour. Third, asset specific investments are inherent in the contracting process due to the need to establish NGO-funding agency relations and the capacity development component required in the establishing of the contract and the project. And, fourth, more contracts imply more asset specific investments along with their associated opportunity costs. Together these factors are likely to lead to what Williamson terms "serious contractual difficulties" where more hierarchical forms of governance are likely to evolve to minimise transaction costs (Williamson, 1987).

A fifth factor is also likely to affect the transaction costs of scaling up. The Williamson framework was developed to examine behaviour and governance in industry and has therefore, for the most part, been applied in the context of profit maximising firms.

More recently, the framework has been used to provide useful insight into the transaction cost implications of the contracting out of public services. In seeking to maximise profit, cost minimisation and therefore transaction cost minimisation forms a part of a firm's objectives. In the context of contracting out services to NGOs the subjects of analysis may have different objective functions to a profit-maximising firm. The funding agency is a public sector purchasing body which may be assumed to be seeking to improve welfare in the form of controlling the HIV epidemic. Cost minimisation is not in contradiction to a welfare maximising objective. Indeed a welfare maximiser would seek to operate with optimal efficiency leading to cost minimising behaviour in line with a profit maximising firm. In this case, it is likely that the agency would seek the transaction cost minimising solution to governance of the contracts. However, a lack of incentives in the public and not-for-profit sector means that cost minimising behaviour may not hold for these funding agencies (Mansley, Dunet et al., 2002). Alternative motivations for the public sector might include output maximising, maximising prestige, non-maximising (satisficing) or budget maximising (Barnum and Kutzin, 1993a). There is little evidence to suggest which is the most appropriate objective to attach to the HIV prevention funding agencies in India. If cost minimisation does not form part of the objectives, the governance of NGO programmes may not be transaction cost minimising. As a result organisational structures are likely to develop in alternative ways and result in forms different to the market or hierarchical governance structures anticipated by the Williamson framework.

As shown in Chapter 4 and Figure 7.1, alternative forms of governance of NGO contracts exist in India as a result of structures imposed by the government and different donors on the SACS. A number of Indian states have introduced another managerial layer by contracting out the management of the NGO contracts. This arrangement is in apparent contrast to the theoretical prediction of internalisation of transactions in addressing problems of bounded rationality and opportunism. These states could therefore be seen to be increasing the transaction costs of delivering HIV prevention activities. However, these costs need to be weighed against the counterfactual costs of internalising transactions achieved through direct delivery or, as is the case in other Indian states, the management of NGO contracts by the SACS itself.

Using qualitative methods, this chapter describes two different approaches to the governance of scaled up NGO contracting programmes and their transaction cost characteristics according to the Williamson framework. In so doing it attempts to test the theoretical proposition that, in the case of publicly financed health services,

although behaviours are not necessarily aligned with profit-maximisation, more hierarchical forms of governance are still better able to cope with serious contractual difficulties and the complexities of contracting with large numbers.

7.4. Methods

7.4.1. Methodological framework

Transaction cost economics first departs from a neoclassical framework in that it is no longer assumed that the transaction is frictionless and therefore costless. A second departure lies in the focus and methods of analysis. As individuals are no longer assumed to be guided only by the price mechanism, organisations and their patterns of behaviour, rather than the individual, become the focus of analysis (Coast, 1999). Furthermore, the non-explicit nature of some transaction costs and the need to understand the transaction characteristics, including patterns of institutional behaviour and the institutional environment, mean that quantitative analyses alone fail to capture the transaction cost problem. The sources of evidence used to identify these patterns and assess the validity of theories are necessarily different from the individual level quantitative data usually used in standard neoclassical economic analysis (Coast, 1999). As a result, qualitative research methods using case studies, semi-structured interviews, focus group discussions and survey of documents have been frequently applied in studies hoping to gain a greater understanding of transaction costs (Masten, Meehan et al., 1991; Ashton, 1998; Allen, 2002; Palmer and Mills, 2003).

In general, qualitative research depends on inductive reasoning to generate hypotheses from the data (Thorne, 2000). However, deductive approaches that start with an idea and use data to test a hypothesis are also acknowledged to have a role in qualitative research, in particular in looking for evidence on theories generated inductively (Dingwall, Murphy et al., 1998). This chapter uses a deductive approach to examine whether the governance implications of variations in transaction cost patterns suggested by Williamson (1983) hold for contracting out HIV prevention services (Williamson, 1983). Following Mays and Pope (2005), the paper assumes a "subtle realist" approach i.e. that in spite of the subjectivity of research, there is some underlying reality, independent of the researcher, that can be identified through the research process (Mays and Pope, 2000; Fulop, Allen et al., 2001). A combination of semi-structured interviews and document review are used to obtain information regarding case studies, purposively selected to represent and describe different contracting models.

7.4.2. Sampling

Two Indian states, Andhra Pradesh and Tamil Nadu, were selected according to HIV prevalence (1% or higher), number of targeted HIV prevention projects funded by the government (greater than 40), variations in contracting models and agreement to participate (see Table 7.1). At the time fieldwork for the study was undertaken, Tamil Nadu had three government supported targeted HIV prevention programmes running in parallel: Tamil Nadu State AIDS Control Society (TNSACS), Chennai Corporation AIDS Prevention and Control Society (CAPACS) and Voluntary Health Services' (VHS) AIDS Prevention and Control programme (APAC). APAC is being implemented by a large NGO with direct support from the United States Agency for International Development (USAID) and in coordination with the National and State AIDS programmes. However, it was excluded from the analysis as USAID denied permission to visit and interview the NGOs (see Chapter 3). TNSACS and CAPACS contract directly with the NGOs, managing the relationship from within the organisation. In Andhra Pradesh, the Andhra Pradesh State AIDS Control Society (APSACS) is the government agency responsible for contracting NGOs to deliver targeted HIV prevention projects. APSACS follows contract model B (see Figure 7.1), employing an intermediary, the Technical Resource Unit (TRU), to manage the NGO contracts.

Table 7.1: Description of the State AIDS Control Societies' Targeted Intervention Programmes in Andhra Pradesh and Tamil Nadu and the NGO Case Studies, 2002

	Andhra Pradesh	*Tamil Nadu*
Programmes	Merging of DFID[1] & APSACS[2] programmes (2001)	TNSACS[3]; CAPACS[4]; USAID APAC[5]
Method of contracting	Intermediary carries out contract management, technical support and monitoring and evaluation on behalf of APSACS[2]	Direct contracting with NGOs
Number of NGO targeted HIV prevention projects	101	TNSACS-65, CAPACS-7, APAC-31
Of which sex worker projects:	18	TNSACS-21, CAPACS-2, APAC-6
Bi-lateral donor	DFID[1]	USAID[5]
No. of case studies	11	TNSACS – 5, CAPACS – 2
Of which sex worker projects:	9	TNSACS – 4, CAPACS - 2
Average Age of NGO, years (range)	18 (5-89)	19 (6-38)
Average years experience with HIV (range)	5 (3-14)	7 (4-12)
Average annual expenditure of NGO, INR[6] (range)	2,420,160 (224,800-105,372,462)	3,862,403 (700,000-45,784,404)
Average no. of staff[6] in NGO (range)	26 (10-477)	43 (8-176)
Number of NGOs with FCRA[7] certificates	10	5

[1]Department of International Development (UK); [2]Andhra Pradesh State AIDS Control Society; [3]Tamil Nadu State AIDS Control Society; [4]Chennai Corporation AIDS Prevention and Control Society; [5]United States Agency for International Development funded AIDS Prevention and Control project (not included in analysis); [6]N=5 for Tamil Nadu; [7]Government issued certificate which allows NGO to receive foreign funds

For each contracting model, a further case study approach was used to collect data on the transaction costs of contracting from the NGO perspective. Commercial sex worker (CSW) projects were selected from the range of different projects, to control for production technology and to strengthen comparative analyses (see section 3.4.1). For CAPACS, TNSACS and APSACS, 2, 4 and 9 CSW projects, respectively, were selected from the mapping study (see Chapter 4 and Table 7.1). Where possible, projects were selected in consultation with the funding agency to represent a range of project history, levels of capacity and experience and location. At TNSACS, these selection criteria failed as many of the NGOs chosen did not respond to our request. As a result, interviews were held with those NGOs available and willing to participate. At CAPACS, the only 2 CSW projects functioning at the time of our census were selected. In addition, to see how transaction costs varied across projects for other

target groups, 2 non CSW projects were included in the analysis. As a result of these selection procedures, there were some differences in the characteristics of the case study NGOs from those in the overall sampling frame described in chapter 4. In the case of Tamil Nadu, the characteristics of the NGOs included in the case study had on average lower overall expenditures and staff numbers but more experience than those that made up the sampling frame (see Table 4.6, p. 111and Table 7.1). In the case of Andhra Pradesh, the case study NGOs had on average lower overall expenditures and numbers of staff, were older but had less HIV experience than the sampling frame average (see Table 4.9, p.114 andTable 7.1).

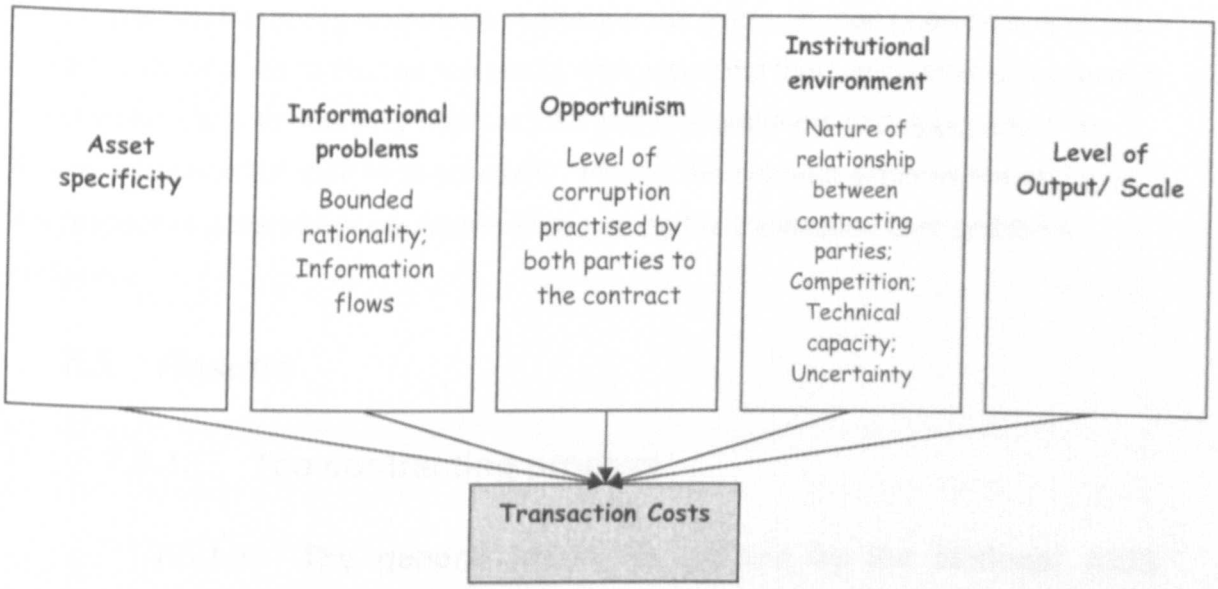
7.4.3. Data collection

Data sources included both semi-structured interviews and document review, as described in Chapter 3. Interviews were carried out between December 2002 and May 2003 following an interview guide (see Appendix 8) by the author and one research assistant. The material covered the time period from June 2001 to April 2003.

7.4.4. Analytical approach

Based on the theoretical construct described in sections 2.7.2 and 7.3, the transaction costs of the contracting out of services to NGOs can be analysed by examining five areas of influence: asset specificity; bounded rationality and other information related problems; opportunism; the institutional environment; and the level of output or scale (see Figure 7.2).

Figure 7.2: Analytical framework for the analysis of the transaction costs of contracting out publicly financed services.



Evidence of these different aspects of transaction costs was extracted from interview transcripts and documents. First, the different institutional environments and contracting processes were documented. Key themes, related to the transaction costs of contracting with NGOs, were then identified using a transaction cost economics theoretical framework (i.e. asset specificity, bounded rationality and other informational problems, uncertainty, opportunism and the institutional environment), documents and the interview data (see Appendix 16). The qualitative data were then manually classified according to those themes. Important themes were identified through triangulation of data, in the form of issues raised by more than one source. Where data sources appeared to contradict the theory or each other, these contradictions were re-assessed in light of the context of the data source. Comparisons of the themes were then made across the contracting models.

A first draft of the findings was circulated around the research team and two key informants, who agreed to read the document, for review. The author's findings were corroborated by the research team. However, in spite of follow up, the key informants never returned comments on the document.

The following section describes the results of the qualitative analysis. Sources are given in brackets (KI=key informant). Where possible quotes are used to underline the key themes identified. However these are not used extensively for two reasons: first, due to the limitations in the English of some of the interviewees; and second, where

interview notes were used these did not necessarily capture the exact phrases of the interviewee. The section first describes the contracting processes under review. Next, it explores the institutional environment and uncertainty in the contracting systems and their impact on the ability to implement effective contracts. It then goes on to analyse the transaction costs of the two models by characterising them according to the level of asset specificity and how they address informational problems and opportunism as they scaled up within their local contexts. Finally, the analysis explores the ability of the respective governance structures to overcome the transaction cost problems identified.

7.5. Results

7.5.1. The contracting process

7.5.1.1. The general model as guided by the National AIDS Control Programme

NGOs are recruited to SACS programmes through an advertisement in the local newspaper (see Appendix 17). The NGOs submit proposals and are short-listed on the basis of a set of explicit criteria, an on-site appraisal and evaluation by a team of experts. Once a shortlist has been drawn up, the Technical Advisory Committee (TAC), consisting of technical advisors of the SACS and the NGO members of the Executive Committee of the SACS make the final NGO selection (National AIDS Control Organisation, 2004b).

The project contracts are legal documents signed by the SACS and NGO appointed project directors[13]. The contract commits the NGO to implementing the project according to their project proposal and on condition of following the financial reporting requirements. Nothing is stated in the contracts as to what penalties would be imposed if there were a breach of contract, nor what entails a contract breach. Given the relatively new nature of the HIV/AIDS problem and the low level of awareness even within the NGO community, technical and managerial capacity was weak at the outset of the SACS programmes (National AIDS Control Organisation, Undated-a). Investment in capacity development, in the form of training, monitoring and experience sharing, is thus a core part of the NGO programme.

[13] Contractual agreements fall under the Indian Contract Act of 1872, see for example: http://www.vakilno1.com/bareacts/indiancontractact/indiancontractact.html, accessed 2nd October, 2006

The HIV prevention project design is largely shaped by guidelines issued by NACO (National AIDS Control Organisation, 2000a). The SACS have closely adhered to these structures, in spite of directives from NACO stating that these are to be used with flexibility (Lenton, Hawkins et al., 2003). As well as addressing capacity weaknesses, the prescriptive approach leads to uniformity and so simplifies the appraisal of proposals and monitoring of the projects. Due to the inherent difficulties of measuring HIV prevention project impact, NACO requirements focus on quantitative monitoring indicators which reflect the outputs of the projects corresponding to the project's components: condom promotion; behaviour change communication; STI treatment/ referral; and creating an enabling environment for the project (see Appendix 18). In addition to this the monitoring system comprises financial reporting, submission of monthly and quarterly technical reports, a twice yearly visit from a team of experts who complete a standard reporting format and the submission of an end of year report. The NGOs also attend experience sharing workshops. All three of the contracting programmes have undergone third party evaluations between 2002 and 2003 (Dalal Mott MacDonald Pvt Ltd, 2002; Sexual Health Resource Centre, 2003)

Grants are released directly to the SACS/MACS by NACO for the NGO projects and other activities according to approved annual action plans. The SACS/MACS in turn remit quarterly expenditure statements to NACO. Funds are then released to the NGOs between two and four times per year, depending on the contracting model, subject to their submission of the NGOs financial and technical monitoring reports requirements. The NGO contracts are renewed annually on condition of meeting monitoring requirements as well as the submission of a proposal and budget.

7.5.1.2. Contract model A: direct contracting in Tamil Nadu (see also Figure 7.1)

NGOs in Tamil Nadu have been engaged in HIV/AIDS longer than in any other state (see section 4.3.1.1). The first AIDS case was identified in Chennai in 1986 and a core group of NGOs took up both advocacy and programme activities in the late eighties through their existing links with key vulnerable groups. Tamil Nadu State AIDS Control Society (TNSACS) was also the first of the SACS. Established in 1996, it increased the number of NGOs contracted by the state programme from 17 in 1994-5 to over 100 in 1997/8 (Seshadri, 2003a). There was no historical evidence to provide an indication of the number of NGOs bidding to win the contracts in the original contract rounds. Having been documented as a model of best practice in terms of ability to spend and scaling up the number of NGO contracts (Ramasundaram, Allaudin et al., 2001; Seshadri, 2003b), the TNSACS programme model was exported around the country.

However, the scale of the TNSACS programme itself was not sustained. Between 1999 and 2002, the number of NGOs supported had fallen to between 40 and 65 NGOs, each of them delivering a single project for this funding agency. Chennai Corporation AIDS Prevention and Control Society (CAPACS) was established in 2001. NGO contracting activities commenced in 2002, with the transfer of all Chennai based, TNSACS funded NGOs to the CAPACS programme.

Once an NGO has been recruited and started implementation, claiming funding instalments requires the submission of monthly reports for the NACO monitoring system and a report from a monitoring team, consisting of volunteer experts from other NGOs. Contract renewal takes place annually with the submission of a proposal for the following year reviewed by a Technical Advisory Committee consisting of technical advisors of the State AIDS Control Societies, the NGO members of the Executive Committee of the State AIDS Control Societies and where possible, a member of NACO would also be part of the selection committee (National AIDS Control Organisation, 2004b). In the event that malpractice is perceived to have occurred, government officials are sent to the NGOs to investigate (TNSACS). If the malpractice is proved to have occurred the contract is stopped and the NGO is blacklisted.

TNSACS has provided 8 different training sessions, attended by 137 NGOs from 1999 to the end of the period of analysis. These are complemented by the experience sharing workshops, although these tend to be sporadic (NGO16). There is no uniformity of participation in training or workshops across the NGOs. A single NGO advisor, with support from clerical staff, is responsible for receiving and processing the monitoring and financial reports. Although a post is assigned for a monitoring and evaluation officer, this post was still vacant at the end of the data collection period. The SACS are therefore dependent on the staff of a core group of capable NGOs for carrying out both capacity development and monitoring for the NGO programme.

7.5.1.3. Contract model B: the management agency approach in Andhra Pradesh (see also Figure 7.1)

The state of Andhra Pradesh has been receiving support for its HIV prevention activities from a number of different sources since 1998. Prior to this, there was little HIV prevention work in the state. In 2001, it was decided that all DFID (Department of International Development, UK) bilateral support to the HIV/AIDS activities in the state should be channelled through the SACS and the management of all NGO-SACS contracts streamlined and contracted out to one agency, the Technical Resource Unit (TRU). Hindu Latex Limited (HLL) was awarded the contract through a competitive

tender and is paid a pre-agreed fixed annual overhead for the management of the TRU over three years (see Appendix 19). The TRU is governed by a project steering committee which meets on a regular basis and comprises representatives from the Technical Resource Unit, Hindu Latex Limited, APSACS, the state Government, DFID and NACO. DFID, however, has followed a hands off approach and distanced itself from the governance of the programme (KIs 1, 5). The number of NGO contracts rose from 23 in 1999 to 101 in 2002, all delivering a single project for APSACS, except for one which has the responsibility for two projects. Interviews with the TRU revealed that there was a significant competition for these contracts when the work was first initiated, with over 1000 applications made. However, during the second round NGOs were selected from the shortlist made in the first round of recruitment.

The TRU employs a team of full-time experts outside standard government employment conditions, implying higher salaries and the freedom to hire and fire personnel. The TRU's budget also allows for the recruitment of additional agencies to provide further technical support for research, planning and development of educational materials, subject to the approval of APSACS, allowing the programme to draw in extra expertise in a timely manner. As well as providing flexibility, the TRU is a third party to the transaction and therefore able to lobby APSACS on behalf of the NGOs, if necessary, while also increasing transparency in NGO recruitment decisions.

The TRU is intrinsically involved in the contract design and renewal process. Once recruited the NGOs are invited to participate in proposal development workshops and trained in carrying out needs assessment surveys. The proposals are subsequently revised in consultation with the TRU. Contract renewal is a consultative process and again the TRU provides direction in activities, target setting and budgeting. Written guidelines in financial management have also been provided to the NGOs to support the contracting process.

The TRU has provided a higher quantity of training sessions than in Tamil Nadu, with greater uniformity across the NGOs. In 2001/02 alone they trained 57 batches of NGO staff, covering 13 technical areas (see Appendix 20). Monitoring visits are also used as a capacity development exercises. The technical team at the TRU processes the NGO reports and provides monitoring and supervision through visits to the NGOs as well as drawing in monitoring expertise from outside where necessary. If malpractice comes to light in Andhra Pradesh, APSACS requests an investigation which is carried out by the TRU. During the investigation the project is suspended and does not receive funds.

Most of the investigations are initiated as a result of anonymous letters or phone calls to APSACS (TRU).

7.5.2. Transaction cost characteristics at the state level

7.5.2.1. The institutional environment and uncertainty

The process of document review and interviews revealed that a number of factors related to the institutional environment and uncertainty in the management of the contracts constrain and facilitate the ability of the SACS to contract effectively with NGOs and adhere to a contracting model. The key factors are described below and include endemic corruption in India which increases the level of distrust in contractual relations, uncertainty, in the form of funding delays, and the level of capacity. Identified examples and the impact of corruption and funding delays are also summarised in Table 7.2.

Distrust between the contracting partners

First, contracting takes place in an environment in which there is already significant distrust between NGOs and corruption is well known (Bennett and Mills, 1998; Transparency International, 2002; Das Gupta, Khaleghian et al., 2003). This distrust appears to be exacerbated in the SACS programmes and manifest in both the reports of opportunism in the interviews for this study and an imbalance in the contractual relationship. Corruption appears to be an endemic problem. It is present both at the funding agency and NGO levels, comprising bribery, staff exploitation, mis-reporting and the funding of non-existent projects. As can be seen in Table 7.2, these practices have led to an effective reduction in expenditures and therefore activities, a poor reflection of actual activities in monitoring reports, a skewed distribution of budgetary allocations and further mis-reporting.

The imbalance in the relationship between the NGOs and their funding agencies was also evident from discussions with the interviewees. The NGOs do not feel they have many rights within the contract, although the contractual document is signed by both parties (NGOs 9, 14, 18; TNSACS).

"It is a one-sided document, except to counter-sign the bond... there is nothing legal we can do if they do not deliver.... (we are) powerless in a legal sense to fight funding delays" (NGO14)

"They can't ask questions – that is the government system" (TNSACS).

Table 7.2: Level and impact of funding delays and corruption on the implementation of the HIV prevention projects

	Level of problem	*Impact on implementation*
Corruption	Mis-direction of funds (NGO 6)	Effective reductions in expenditure on activities
	Under-appointment and under-payment of staff for whom full salaries are claimed (KI ; TRU; NGOs 9,10)	Monitoring does not reflect reality and therefore inability to identify gaps in services
	Mis-reporting of activities (NGOs 6,9,10); mis-use of STI drug and travel allowances (NGO 10; TRU)	Activity levels lower than reported and funded
	Staff and target group exploitation (NGO 9; TRU)	Encourages NGOs to mis-report in order to demonstrate they have met targets
	Bribing of government officials and management agency staff (TNSACS; KIs 1,3,4; NGOs 8,10,14,16,17)	Larger budgets awarded to those NGOs willing to pay bribes rather than those with greatest need
	Projects funded but not in existence (research team observation)	
Funding delays	Funding delay of approximately 11 days per NGO (Sexual Health Resource Centre, 2003)	Without being able to plan for the funds NGOs borrow or spend from their reserves (NGOs 5,8,9,10,14,16),
	3 case studies experienced delays on 7 different expected releases over 4 years, ranging from a few days to 8 months (TRU planning survey data – see Appendix 21)	NGO budgets are squeezed (NGOs 5,9,19),
	NGOs not reporting delays in quantitative form complained that were always delays (NGOs 6, 14, 9, 12)	Cannot pay salaries (NGOs 11,15,17,18; KI 2)
		Lay off staff or close the project (NGO 17).
		Heighten the level of distrust between NGOs and the government.

Delays in funds

Second, the funds released by NACO to the SACS rarely meet the budget that they have approved and fund releases are regularly delayed (KI 5; APSACS). This leads to delays in the release of funds to the NGOs (see Table 7.2). In turn this results in an inability to plan, in drawing on reserves, the inability to pay salaries, project closures, and an increased level of distrust between the NGOs and their funders. The cause of these delays relates to both the expenditure ceiling of the Government of India's 10th Expenditure Plan and capacity limitations at NACO (KI5). Funding delays are further exacerbated by inadequate resources, financial, human and technical, at the NGO and SACS.

Frequency of contracting

Third, NACO guidelines recommend that administrative approval should be given for 3 years. In practice the contracts are renewed on an annual basis (NGOs 6, 13, 14, 17; KI 2). This serves to increase uncertainty and, coupled with the persistent funding delays, limits the ability to plan over the longer term.

"The planning would be different ..... without the bread there I cannot plan to cut it" (NGO 15)

Capacity

Finally, technical capacity, in the form of skilled personnel, or lack of it, at the SACS level has been vital in shaping the programmes in Andhra Pradesh and Tamil Nadu. At CAPACS, decision-making was constrained by political influence over-riding technical inputs in the budgeting setting process (NGOs 13, 14) and during a single year there were four changes of director. This has limited the ability of the SACS/MACS to reach full capacity (CAPACS; NGOs 13, 14), evident in the decision-making processes:

"They (the CAPACS technical advisory committee*) check the credibility of the proposal then recommend. But it was not so seriously done. It didn't give us the impression they had applied their minds at all" (NGO 14)*

Similarly, TNSACS directors have remained in post for periods of up to 12 months, weakening the ability to develop and sustain capacity. The changing capacity at this level has also had important impact on the contracting model. The first TNSACS director developed the "best practice" SACS by ensuring the clean up of corrupt systems, instituting transparent financial and activity monitoring systems and so facilitating fund absorption (NGOs 6,14; KI 1) (Ramasundaram, Allaudin et al., 2001). The NGOs showed a great deal of respect for TNSACS during the period of this directorship. They expressed disappointment in the subsequent leaders and their frequent changes, stating that programme quality had declined considerably (KI 1; NGOs 6, 14, 16):

"In 1995/6 X came to be PD (TNSACS director) – then only they set up system and structure, he changed it" (NGO6)
"Now (2002) *corruption has come back in" (KI1)*

In contrast, in Andhra Pradesh, there has been continuity of the SACS directors. The former director at APSACS was in post for a period of 2 years. The time allowed for learning and innovation: he appointed technical project officers to work with the NGO advisor and worked with DFID to merge the NGO programmes and recruit the TRU. The director in place throughout this study has been in post for over 2 years, also allowing for learning and a sense of ownership (KI 5).

Empty or inadequately filled staff posts also delay programme activities and reduce technical capacity. TNSACS and CAPACS have suffered from empty staff posts and mixed quality of personnel. At TNSACS, the NGOs describe mixed experiences with the NGO advisors (NGOs 6, 14, 16), who are crucial to the smooth functioning of the programme. In particular they expressed a complete loss in faith in the current post holder:

"I don't know what his (current NGO advisor) constraints are" (NGO 16)

At CAPACS, the post of NGO advisor had yet to be filled: although an appointment was made during the time of the study, the individual only remained in post for a few months. Similarly, although the TRU in Andhra Pradhesh are better technically resourced and have managed to fill critical NGO programme management posts, a large under-spend in the first year of activity can be partially attributed to the 6 month absence of a Team Leader (TRU).

Technical, financial and management skills are required to ensure effective monitoring and overcome the constraints of the institutional environment such as fund flow problems, short term perspectives in planning and corrupt practices. In Andhra Pradesh continuity has led to capacity development and the facilitating of NGO partnerships, reducing the distrust between the contractual parties. The apparent lack of capacity within the SACS has contributed to weakness in the contractual governance and continued distrust within the Tamil Nadu programmes at the time of the study.

7.5.2.2. Asset specificity associated with targeted HIV prevention projects

Where asset specificity is present, barriers to entry and exit in the contract are created and so the problems of bounded rationality and opportunism are exacerbated. The investment in partnership with the NGOs, the capacity development and the establishing of NGO-target community links are all asset specific investments in the HIV prevention service contract. The development of funder-NGO partnerships and capacity are both associated with opportunity costs if the contract is terminated. Therefore the funder has an interest in maintaining these contracts. The dependence on the NGOs is evident in both states, although the investment in training, contact time with the NGOs and the development of partnerships with the NGOs vary across the programmes. In Andhra Pradesh, it has led to falling competitiveness in the NGO sector: the second round of NGO recruitment did not involve re-advertisement but a return to the original shortlist of NGO applicants; and, more recently, under the TRU,

when a need for re-focusing some of the less successful projects was identified, rather than terminate contracts and re-advertise, the existing NGO partners had their projects re-designed. TNSACS presented a genuine concern that the NGOs might seek funding from other sources:

"*If they (NGOs) have FCRA certificate (registered to receive foreign funds) they will go elsewhere*" (TNSACS)

If the NGO loses the contract, there is a real possibility of securing funding from elsewhere given the current momentum in HIV programme funding in India. On the other hand, there are also opportunity costs of losing the contract, associated with: losing the status of implementing a government supported project; seeking funding elsewhere; and funding gaps that may mean they lose the trust of the communities with whom they work.

7.5.2.3. Informational problems and opportunism

With the funding agencies tied into the contractual relationship, they require mechanisms to ensure that NGOs deliver according to plan. Informational problems are inherent in the system: as noted above, the monitoring of the impact of HIV prevention projects is problematic. This is compounded by the limited ability of external evaluators to communicate with marginalised groups such as commercial sex workers, access to whom maybe dependent on the NGOs themselves, and by limited capacity in HIV/AIDS programming, financial management and reporting. Transaction cost theory predicts that these will be the underlying causes of contractual difficulties. The ability of the contracting programme to deal with these informational problems is likely to be key to its success, yet, in spite of the central guidelines, how the systems meet this challenge and their success in doing so differs considerably across the two states.

Tamil Nadu

The monitoring system in Tamil Nadu is seen as particularly weak (Dalal Mott MacDonald Pvt Ltd, 2002). Document review of monitoring records at TNSACS for this research found it impossible to track activity and financial reports: there were inconsistent sets of data across NGOs; and complete sets of reports were not available for the majority of NGOs. Quality of the projects is also unknown (Comptroller and Auditor General of India, 2004). External evaluations for Tamil Nadu did not capture quality and NGOs report that queries from TNSACS focus on the financial rather than the technical (NGOs 6,8). Other problems in the system include: lack of feedback from the monitoring teams to the NGOs (NGOs 6,8,19); insufficient resources for NGO supervision (KIs 6, 7); mis-reporting of outputs and activities (TNSACS; NGO 6); and potential bias in the monitoring team who are all staff from "competitor" NGOs (other NGOs in contractual partnership with the SACS/MACS) (NGOs 6, 8). In addition, one key informant criticised TNSACS for simplifying its financial monitoring system. Although the former system had caused delays, it had screened out misspending of up to £1 million over three years. Nevertheless, in spite of concerns regarding corrupt practices, TNSACS had blacklisted only one NGO since 1996.

One NGO had strong feelings about TNSACS monitoring:

"*There is no monitoring system*" (NGO 6).

Andhra Pradesh

In contrast, in Andhra Pradesh, the NGOs perceive the monitoring in the APSACS programme as a strength and a vital part of the contracting system (NGOs 2,9), placing importance on its capacity building aspects (NGOs 8,18,19), in spite of the quantitative emphasis (NGOs 9,10,12) and the time required (NGOs 2,15).

"*The monitoring system is best; it allows us to make rectifications... it may be time consuming but it will improve and support our work*" (NGO 18)

The NGOs also place importance on their relationship with the TRU and APSACS:

"*Transparency is there; ....anything we will discuss; .... Ours* (relationship) *is informal – we are friends ....*" (NGO 2)

"*APSACS is a good donor.... providing to the NGOs funds and guidance and training*" (NGO 5)

In Andhra Pradesh it appears that the TRU, as a third party, is able to make NGO recruitment and evaluation more transparent (KI 5). Facilitating this transparency are the experience sharing workshops where incidence of NGO staff exploitation were uncovered. It appears better able to overcome opportunistic behaviour:

"*Can't give* (external evaluators) *bribes – the NGOs don't know them*" (NGO 8)
"*There is very little corruption in the TRU programme*..... (In other government funded programmes) *those people they directly ask for money*" (NGO 2)

By mid 2003, the TRU had completed investigations on 9 NGOs and 5 projects had been terminated. In addition, the TRU has used its flexibility to remove their staff when found to be involved in bribery (KI1).

7.5.3. Governance arrangements for scaling up

The key features influencing the transaction costs of the different models are summarised in Table 7.3. In both contracting models, the funding agency is found to be in a "hold up" situation where the investment in capacity development and establishing of a contract makes them reliant on their contractual partners. However, evidently, the methods used to manage the large numbers of NGO contracts, informational problems and opportunistic behaviour diverge.

Table 7.3: Transaction cost characteristics of contracting for HIV prevention services in India

	General contracting model	Contracting model A (TNSACS/CAPACS)	Contracting model B (APSACS)
Asset specificity	Associated with investments in capacity development, NGO links with community, NGO-funding agency partnership	Dependency on core of technically competent NGOs; limited and varied inputs to training for NGOs	Uniform capacity development; supervision, consultative project design and monitoring process strengthens NGO/TRU relations
Bounded rationality	Inability to measure impact; Emphasis on quantitative indicators of output/ process	Monitoring system is weak; Simplified financial reporting procedures; External evaluation for all NGOs completing 3 years of funding; Issues of technical quality not addressed.	Monitoring and supervision by team ensures TRU knowledge of programme implementation
Opportunism	Traditional barrier of distrust between NGO and government; Endemic corruption in India	Opportunism persists at NGO & SACS level; simplification of financial procedures leads to further exploitation; only 1 NGO project stopped.	Opportunism persists but identified and penalised – 5 NGOs have had projects terminated; removal of implicated staff

Tamil Nadu (contract model A)

At TNSACS the high costs of funding delays and contractual frequency led to the streamlining of financial and other monitoring requirements. Under the conditions of dependence of the funder on the funded, the degree of NGO autonomy and the distance between the NGOs identified in the analysis, Transaction Cost Economics predicts that contract model A, implemented by TNSACS and CAPACS, will operate within a relational type governance structure. However, it appears that this structure's ability to implement the current programme size is limited with the number of NGO contracts falling during the current phase of the programme. Observations suggest that TNSACS simply had too many projects to carry out the intensive monitoring required (NGO 6; KI 2). Funding delays persist, problems with meeting monitoring requirements are evident and capacity development has not been adequately realised (NGO 6, 16, 14). Added to this, the contracting programme continues to be undermined by opportunism (see Table 7.2).

Andhra Pradesh (contract model B)

By providing for greater operational independence and flexibility in recruiting technical expertise, the management agency model is able to deliver more NGO projects and scale up the number of contracts faster (Soni and Jani, 2001). APSACS used the management agency mechanism to implement the scale up of its NGO programme.

The TRU plays a directive role in project design and budgeting. All NGOs receive training in both technical and managerial aspects of the programme. Capacity development inputs have led to strong ties between NGOs and with the management agency, accountability and clarity in the project methods, with one NGO comparing the structure to a company (NGO 15). A technical team strengthens the NGO links with the management agency in a way that the single NGO advisor at TNSACS is not able to achieve.

With the merging of the management structure and as the number of NGOs managed by a single structure has increased, some NGOs have found the contractual process declining in quality:

"With the large number of NGOs now monitoring is not really happening; loose ends are there and misuse" (NGO9)
"Now the NGOs are more the capacity development is less; slowly it has come down. It is happening but less than compared to before" (NGO2)

In spite of these problems encountered by the NGOs and persistent opportunistic behaviour, it is evident that the TRU and APSACS still maintain considerable control over the design and implementation of the individual projects and are able to reduce corrupt practices (KI 1). This greater control and closer relations between the NGOs and the management structure in contract model A implies that the organisation of the contracts is more integrated and tends towards a more hierarchical form of governance.

7.6. Discussion

The analysis presented here explores the transaction cost characteristics of two models for contracting out HIV prevention services in India and how closely these relate to transaction cost theory as described by Williamson (1987) (Williamson, 1987). Using a deductive qualitative approach, based on a combination of document review and semi-structured interviews and supported by the research team's observations, the analysis shows how transaction costs for these complex contracts appear to be reduced by more hierarchical governance of the NGOs. Paradoxically, however, due to the inflexibility of the Government of India bureaucracy, this form of integration could only be achieved through contracting out the management of the NGO contracts.

The Williamson framework was developed for analyses of the private sector and assumes profit maximising behaviour. However, previous analyses in the public sector

that build on the Williamson framework have shown that asset specificity, bounded rationality and opportunism are still important factors to consider in the process of contract design (Ashton, 1998; Palmer and Mills, 2000; Allen, 2002). In the context of contracting out HIV prevention services in India, where government contracts with not-for-profit organisations, the same factors apply. HIV prevention services are difficult to monitor creating informational problems. There is a need for considerable asset-specific investment in training, monitoring and supervision associated with establishing the programme. In addition, the HIV prevention programme in India is plagued with uncertainty arising from fund management and opportunism. According to the theory, the combination of these factors all point towards "serious contractual difficulties" and the need for more hierarchical forms of governance. At the same time contracting out of HIV prevention services by the government was a deliberate move away from the hierarchical Government of India bureaucracy in the search for efficiency.

The hierarchical form of governance as described by Williamson (see section 2.7.2.1) is not immediately apparent in either of the contractual models under observation in this study. Evidence from both states demonstrates how comprehensive contracting has not been feasible given the combination of bounded rationality and opportunism inherent in the nature of the services combined with the features of the local context and contract design. In Tamil Nadu the SACS reduced the demands on the monitoring system to minimise delays, depends on a core of technically competent NGOs to help roll out the programme and has taken a bottom up approach to planning and to contract management (see Table 4.5, p.29). A more relational style contract has therefore been seen to evolve. The NGOs have freedom to implement their respective project designs and penalties against project mis-management are limited. In addition, the level of technical resources and commitment available at the funding agency has further constrained the ability to effectively manage the contracts. As a result, opportunism and funding delays have persisted, there has been inadequate investment in capacity development and the number of NGO contracts has declined. Without major change in the contracting system and renewed commitment in the form of resources, the success of this relational contracting is determined by the extent to which opportunistic behaviour of both parties continues.

In Andhra Pradesh, APSACS contracted out NGO contract management to a third party. In the context of the profit-maximising firm or well-performing bureaucracy, this would represent an even greater step away from hierarchical forms of governance. However, in this case of limited capacity within the SACS and distrust between contractual partners the opposite appears to be true. An alternative form of

governance that combines contracting out with hierarchy has been imposed on the contractual relationship. By creating an opportunity for flexibility in management and through the increased availability of resources, the process of contracting out has led to greater direction in project design, stronger capacity development, investment in NGO partnerships and direct supervision. As a result the governance of the contracts has become more rather than less hierarchical. This hybrid form of hierarchical governance appears to be better able to cope with the informational problems and opportunism identified in the contracting models as well as the scaling up of the NGO programme.

It could be argued that the improved ability to manage the contracts associated with the management agency is a result of absolute funding levels rather than the governance arrangements and their ability to minimise transaction costs. Evidence from Tamil Nadu suggests the contrary where, in spite of the budget increasing from INR 40 million to INR 64 million, TNSACS expenditure on the targeted intervention programme fell from INR 55 million in 1999/2000 to 26.5 INR million in 2002/03. This implies that the problems do not lie in resource constraints but rather in ability to spend. Although comparable figures are not available in Andhra Pradesh, due to the changing management structures over the period of analysis, it can be inferred that financial costs are necessarily higher with a management agency than without. The thesis findings suggest that these extra costs have helped to offset the opportunity costs of weak monitoring systems, poor technical and financial reporting capacity, NGO distrust of government (and vice versa) and opportunism, even increasing the ability to spend and scale up.

Several limitations to the analysis need to be noted. First, the qualitative nature of the study does not facilitate a direct comparison of the two models and it is not possible to identify on an absolute basis which contracting model has minimised transaction costs. Instead, the study aims to identify the nature of those transaction costs and, through analysis of the qualitative information gathered, ascertain which contractual model is more successful in scaling up NGO contracting. Second, the documentation sourced for the study was mixed in quality. There were conflicting figures on expenditures, coverage and number of NGO contracts given in different documents and it was often difficult to discern the reality. Where there was doubt, figures that are reported to NACO were used. However, this level of uncertainty in reporting only served to underline some of the findings regarding the informational problems. With regards to the interviews, many of the NGOs perceived that we came from their funding agencies, in spite of explanations that we were not, and their answers could have been shaped

by this perception. In addition, the differences between Indian English and British English complicated the explanation of some issues, possibly leading to misunderstandings or misinterpretation. Further, not all interviews were taped. Although the notes of the interviewer and the research assistant present were cross-checked against each other, it is recognised that there can be flaws in note taking and they can be more prone to greater subjectivity than taped and transcribed interviews.

A final limitation relates to the sample. APAC has a high profile and as such is perceived as an important model for the implementation of NGO HIV prevention projects. Without an understanding of the transaction costs in this system of governance, it is possible that the study misses an important component of HIV prevention activities in Southern India. However, the APAC model is funded by USAID and operates relatively independently of government. It is questionable whether this is a model that the Government of India could replicate in other states. On the other hand both contract models A and B are managed and funded through government channels. The lessons learnt from the analysis of transaction costs in these two models are therefore more likely to be relevant to government supported programmes in other states than those learnt from a model such as APAC.

As investment in HIV prevention continues and the SACS programmes evolve, the contracting models have important lessons for the next phase of the National AIDS Control Programme as well as to other South Asian countries, where similar NGO contracting programmes are being supported by the World Bank (e.g. Bangladesh and Pakistan). Policy lessons derived from the analysis are threefold. Firstly, contracting out the management of the NGO contracts is a method that can be used to overcome the informational problems associated with the service itself as well as the bureaucratic constraints observed in the SACS. Second, transaction costs might be reduced and project quality improved by re-designing the financial procedures to enable longer term planning, while retaining an incentive for NGOs to perform. Third, an important factor in minimising transaction costs is strong positive relationships between the NGOs and their funder or management agency indicating that where two or more projects implemented by a single NGO are funded by the same agency, technical and managerial skills and the investment in partnership building can be shared across the projects. In other words, increasing the number of projects a single NGO implements has potential for increasing returns to the transaction costs. However, in nearly all cases across the 993 contracts with NGOs in the National AIDS Control Programme, each NGO implements no more than one project for their respective SACS programme. Scaling up by these programmes would benefit from identifying NGOs

that could implement more than one project for the funding agency. Indeed, visits to India after the completion of the data collection suggest that the SACS are now exploring the possibility of increasing the number of projects implemented by existing contracted NGOs as well as contracting further NGOs.

As well as the important policy lessons, the analysis has shown that the transaction cost economics framework provides a useful tool in helping to understand the nature of contractual relations in the public as well as the private sector. It confirms that even where profit maximisation is not the motivating behaviour of contractual parties, more hierarchical forms of governance are better able to cope with contracting in large numbers. However, the provision of targeted HIV prevention projects in India also requires overcoming problems associated with public sector bureaucracies normally associated with hierarchical governance. As a result, in order to minimise transaction costs, it appears that these services require different approaches to governance than those predicted under the Williamson framework.

7.7. Conclusion

The application of the transaction cost framework to the situation of contracting out public services to not-for-profit organisations has allowed the identification of key costs associated with the governance of HIV prevention services through NGO contracts in India. The analysis shows how a more hierarchical form of governance has evolved within the network of the contract management agency and the NGOs. This has led to greater transparency, improved flows of information and perceived quality, and limited corrupt practices. In turn the reduction in opportunity costs of poor quality and leakage arising from poorly managed transactions, in spite of higher financial costs, highlights the importance of more hierarchical governance systems where there are "serious contractual difficulties". It is unlikely that the SACS on its own, with its broader responsibilities and limited autonomy can achieve the same ends. The management agency approach therefore appears to be both transaction cost reducing and better able to cope with the scale of these contracting programmes. The results presented here indicate that in the case of public sector financing of HIV prevention services more hierarchical contractual governance, in a hybrid form not anticipated by Williamson, may be required in contracting out, in particular where there are a large number of contracts and opportunism is evident.

Chapter 8. Discussion and conclusions

8.1. The costs of scaling up HIV prevention interventions

This thesis has examined supply side issues in the expansion of HIV prevention services for vulnerable groups in Southern India where they have been contracting out services to non-governmental organisations. In low income countries contracting out of health services to the private (including not-for-profit) sector has been introduced as a means to increase coverage and improve efficiency (Nieves, La Forgia et al., 2000; Slack and Savedoff, 2001; Vladescu and Radulescu, 2002; Harding and Preker, 2003; Liu, Hotchkiss et al., 2004; Loevinsohn and Harding, 2004; Peters, Mirchandani et al., 2004; Loevinsohn and Harding, 2005). In India the rationale for working with the NGO sector in HIV prevention has been driven by both these objectives (Bennett and Muraleedharan, 2000; National AIDS Control Organisation, Undated-a). As a result of different patterns of aid at the state level and the autonomy of State AIDS Control Societies different methods for contracting out similar services to NGOs have evolved. The size of the contracting programmes and the variations in contracting models in Andhra Pradesh and Tamil Nadu presented a unique opportunity to examine how production and transaction costs vary with levels of coverage and the nature of the organisational arrangements. This study was therefore the first to collect and analyse a standardised set of cost data for a single HIV prevention activity from multiple sites. The unique set of data allowed for the first statistical exploration of the factors affecting costs of targeted HIV prevention projects. Further, the study is also the first to explore the impact of transaction costs in the governance of HIV prevention programmes. It therefore provides original insights into the nature of transaction costs in large scale programmes for HIV prevention in India.

8.2. Overview of the findings

8.2.1. Production costs

The production cost analysis found extensive variation in total and average costs as well as the cost structures of the individual projects. Scale, defined by both coverage and volume (which were further defined as the outputs of the HIV prevention project), was the leading factor in influencing the level of average cost. Accounting cost studies in the health services literature suggest that there are falling average costs in primary care (Creese, Sriyabbaya et al., 1982; Robertson, Davis et al., 1984; Over, 1986; Berman, Brotowasisto et al., 1989; Robertson, Hall et al., 1992; Broomberg and Rees,

1993a; Soucat, Levy-Bruhl et al., 1997; Jian, Jing-Jin et al., 1998; Ensor, Ali et al., 2003; Johns and Baltussen, 2004; Routh, Thwin et al., 2004; Terris-Prestholt, Kumaranayake et al., 2005a). However, the results of this study show that average costs fall over a limited range of coverage, up to between 1500 and 1800 commercial sex workers. At greater levels coverage average costs begin to rise again.

Unlike the review of accounting cost studies in Chapter 2, meta-analyses of econometric analyses of health services have been inconclusive about the presence or not of economies of scale (Barnum and Kutzin, 1993b; Barton, Bloor et al., 2004; Goldman and Grossman 1983; Kass, 1987; Mansley, Dunet et al., 2002; Smet, 2002; Wouters, 1993). Econometric analysis of both a set of NGO case studies and a larger financial dataset of the costs of HIV prevention that are presented here find that the index of economies of scale varies with the level of coverage and that average costs are falling. However, the case study sample confirms the presence of a point of minimum efficient scale whereas the analysis of the financial dataset finds that average costs continue to fall within the coverage range of the sample.

Although hypothesised to have an impact on average costs, other factors including production technology, scope, input prices, technical inefficiencies, context and the timeframe have been less well-explored using econometric techniques (Barnum and Kutzin, 1993b; Johns, Baltussen et al., 2003; Smet, 2002). This thesis explored a number of these factors and found that age of the project, input prices and capacity were not causes of variation in the total cost. On the other hand the state, funding agency and context (as measured by the literacy level) were found to contribute to variations in total costs. For project age, state and funding agency, these findings were confirmed by both the case study analysis and econometric estimation of cost functions. The cost function estimation also found that regional variations in prices and the nature of the target group were significant causes of variation in total costs.

8.2.2. Transaction costs

In exploring the transaction costs of scaling up, scale was defined by the number of NGO projects delivering services within each contracting model. In the profit maximising world of the private sector, the attempt to minimise transaction costs or the perception of transaction costs leads to different organisational forms (Williamson, 1987). The nature of transaction costs is shaped by the level of bounded rationality, opportunism and asset specificity associated with a transaction (Williamson, 1987) (see p. 62). HIV prevention services are inherently difficult to monitor, contracting out for HIV prevention services in low income settings requires a considerable degree of

capacity development to ensure fulfilment of contractual obligations and corruption is widely reported in the Indian public services. According to the theory, this combination of factors would lead to "serious contractual difficulties" and bureaucratic forms of organisation to overcome some of these difficulties. However, bureaucratic delays and lack of capacity in the government sector has been one of the factors leading to contracting out HIV prevention services in India (Bennett and Muraleedharan, 2000). By setting up semi-autonomous SACS, which act as purchasers of services, the NACP intended to overcome some of the bureaucratic delays associated with the government sector (Ramasundaram, Allaudin et al., 2001). The results presented here, however, show that the limited capacity within the SACS only serves to exacerbate the informational problems of contracting out HIV prevention services and has permitted corrupt practices to continue among both SACS and NGO partners. The presence of an agency to manage the NGO contracts, as implemented in contract model B (see Figure 7.1, p.199), appears to help overcome some of these problems. In spite of contracting out both the services and the management of the NGO contracts in Andhra Pradesh a more hierarchical style of governance is in place.

Importantly, the hierarchical form of governance that has evolved within the network of the contract management agency and the NGOs has led to greater transparency, improved flows of information and perceived quality, and limited corrupt practices. By seeming to control the opportunity costs of poor quality and leakage, the recruitment of a management agency appears to be transaction cost reducing. However, the Williamson framework implies that internalisation of the transactions would normally occur to overcome such issues of bounded rationality, opportunism and asset specificity (Williamson, 1987). As a result the analysis presents a paradox when applying Williamson transaction cost framework in the public sector. Rather than a classical hierarchical form of governance being in place to overcome contractual difficulties, the management agency approach, i.e. contracting out the transactions, appears better able to cope with the level of scale of these contracting programmes in which over 50 NGOs hold individual contracts with the SACS and require capacity development, monitoring and evaluation.

8.2.3. The full costs of scaling up

As stated in Chapter 2, an understanding of both production and transaction costs is required to assess gains or losses in efficiency associated with changes in health services. The analysis presented here shows that production and transaction costs vary with scale of activity. The results fillI a gap in the evidence base regarding the

nature of the variation in total and average costs as such activities are expanded as well as the efficiency of different approaches to contracting out used to increase coverage. The thesis confirms the importance of the influence of scale on cost but that this varies with the type of project. It also shows how contextual factors need to be considered in the analysis of costs, in particular geographical location (input prices and state), institutional arrangements (funding agency) and socioeconomic context (literacy).

Analytically it is difficult to consider production and transaction aspects of costs in conjunction. The production costs, as defined in this thesis, can be measured quantitatively, whereas transaction costs are non-quantifiable. A quantifiable comparison between the different contractual models in the transaction cost analysis can be made using the econometric techniques. Using the case study data it is possible to explore the impact of the funding agency on the production cost of the HIV prevention project. A rejected model in Table 6.6 (p. 183) examined exactly this and found that the total costs of the TNSACS, CAPACS and CCOOR prevention projects were 35%, 11% and 13% lower than the APSACS projects, respectively. This result may have arisen, in part, to differences in the quantifiable aspects of transaction costs, for example the monitoring and supervision costs of the management agency. However, it is important to note that this does not include the immeasurable costs of governance such as corruption, mismanagement or weaknesses in quality. Indeed, in the absence of final health outcome data, the qualitative analysis of transaction costs indicates that it is questionable whether the lower production costs observed in the TNSACS projects are a true reflection of more efficient services.

8.3. Limitations

8.3.1. Conceptual problems in measuring scale

The comparison of scale across different projects requires uniformity in the definition of scale. Scale has been looked at from two different levels of the system reflecting the nature of activities at these two levels and the goals of the national programme. In exploring production costs scale is defined as the coverage of the project and the volume of services provided at the NGO project level whereas in the transaction cost analysis scale is defined as the number of contracts funded and managed at the programme level. On the surface the definition of output measures at each level are similar across the units of analysis. However, variations in production technology and quality of services may imply that there is variation in how these outputs are actually measured across the programmes and projects. Ideally, in looking at the allocative

efficiency of a programme, an outcome measure such as HIV infections averted compares like with like and would provide an appropriate measure of output for both levels of the system examined here. However, this is expensive and complicated to measure, requiring randomised control trials and/or mathematical modelling (Merson, Dayton et al., 2000; Grassly, Garnett et al., 2002). Furthermore, this outcome provides a picture of the scale of the impact of a project or programme but does not measure scale as in the size of the programme or volume of services in a manner that relates directly to the production function of a programme.

So that the output indicators used in the thesis are similarly defined, only a limited set of services were selected for analysis. Not only was the focus constrained to HIV prevention projects for vulnerable groups but, within that, the case study analysis focussed solely on projects for commercial sex workers. In addition, all these projects operated under similar guidelines issued by the national programme which provide for a specific staffing structure. As noted in Chapter 5, variations in the method of service delivery persisted in particular in the method in which STI services were provided. However, more subtle differences may also exist in the form, for example, of variations in the quality of services provided. The cost implications for these variations and whether these variations are systematic across the NGOs or are tied to, for example, the funding agency, as suggested in Chapter 5, are areas for further research that would facilitate the generalisation of these results.

8.3.2. Problems in access to data

The mapping survey provided detailed insights into the nature of HIV prevention services and the range of funding agencies. The sampling frame was intended to include the full range of contracting models as well as case study NGOs that fulfilled a range of characteristics. Unfortunately without permission to access the USAID supported Tami Nadu programme, APAC, an important component of HIV prevention services was excluded. Without APAC included in the sample, the research concentrated on those funding programmes that were implemented directly by the SACS i.e. state government programmes. As a result, the research results contain important lessons for the government response in India and other similarly structured government-supported programmes outside India.

In addition to the exclusion of APAC, many NGOs were simply unreachable and we were therefore unable to include them as part of the case study analysis. The reasons behind their non-response were varied and most likely included unwillingness to participate in the study. Willingness to participate may be associated with quality of the

service delivery or information systems, in which case there is a possibility of some bias in the results. In particular, the exclusion of the APAC NGOs is likely to have led to a downward bias on costs given APAC's higher budgets (see Chapter 4). In certain cases, as confirmed by two different key informants, some of the NGOs did not exist and were fronts for their Executive Directors to receive funds. As such these non-existent NGOs were relevant to the transaction cost analysis in that they revealed the corruption and lack of accountability in the system.

8.3.3. Data availability and limitations in measuring and analysing costs

The collection of full economic costs was more problematic than had originally been predicted. Arising from a lack of records and the autonomous nature of the research, access to the information on full economic costs including output measures was difficult and time consuming to obtain. Unlike collecting cost data in a trial setting or as part of operational research, the retrospective nature of cost data collection at operational programmes is subject to these risks of missing information. In addition, although permission might be granted, organisations may have been less than willing to reveal a full picture of activities and costs particularly where they feel vulnerable to the changing funding opportunities. This is exacerbated by the limited time of personnel, whose priorities are project delivery, and where there are practices of corruption.

Where there are good information systems there will necessarily be better information regarding project implementation, outputs and costs. As improved information systems might be a reflection of better capacity, by limiting the analysis to projects where information was accessible could have resulted in a bias in the results. Where there were information gaps, the research team sought different strategies to fill the gaps such as obtaining output data from centralised systems for collection of monitoring information at the funding agency level. It was not possible, however, to prevent the impact of corruption or mis-reporting and errors in reporting from entering into the dataset where no other sources of data were available to facilitate cross-checking or triangulation.

Further complicating the collection of cost data in both qualitative and quantitative form were the dynamics of an operational programme. Activities are necessarily changing, as the programme evolves and lessons are learned. Pinpointing a timeframe and maintaining that timeframe consistently across NGOs and different programmes can therefore become difficult. For example, if asked a question about how a programme

was functioning two years ago, the respondent is likely to be influenced by the nature of the programme today and how it has changed.

Poor quality monitoring systems and corruption have led to some weaknesses in the accuracy of the data. To help resolve this, for the case studies, each HIV prevention project was sent the cost analysis in draft format for their input and review of the data. Although this could not overcome the problem of corruption, it helped to rectify problems of mis-reporting or inaccuracies in the data. Similarly, reports on the transaction cost analysis were sent to the funding and management agencies and key informants for their comments. While each of the case studies returned the production cost reports with their inputs and revisions, the funding and management agencies did not respond to this request, presumably due to lack of time.

Each of the datasets used for the analysis of production costs had its advantages and disadvantages. The case study data yielded a relatively small sample size which limits the power of the statistical analysis. The financial data, collected in Andhra Pradesh, provided a larger sample strengthening the econometric analysis. However, the economic cost data collected from the case studies provide a more complete picture of the costs of production, in particular in relation to the fixed costs of production. The difference in the nature of the datasets limits the validity of the comparison of the cost function which is illustrated by the different order of magnitude in the marginal costs. However, consideration of the fixed costs of production have not been excluded from the analysis of the financial dataset as many of these e.g. staff and rented office space, are supported by the funding agency and reported in expenditure statements. The dummy variables indicating which phase of recruitment the NGO falls also takes account of some variations in fixed costs as these fixed costs are incurred by the funding and management agencies and differences between these costs will be observed only at this level. Both sets of data, however, are cross-sectional. This limits the ability of the analysis to pick out the difference between the short term and long term concepts of variable returns to scale and economies of scale, respectively. In effect this implies that where differences in average cost are observed this maybe due to differences in variable cost, for example re-training, when fixed costs remain constant (short term) or when production technologies change and both fixed and variable costs are varied (long term). The rising costs beyond coverage levels of around 1500-1800 CSWS in the case study sample maybe related to the fact that the analysis has captured the short run cost curve and that once methods of production have been adjusted to meet the requirements of larger scale projects, average costs could fall again.

8.3.4. Non-quantifiable transaction costs

Obtaining the complete picture of transaction costs can often be undermined by the difficulties in collecting the appropriate data. Given the impossibility of quantifying transaction costs the thesis has used qualitative data to explore this aspect of costs. It is therefore impossible to combine the qualitative transaction costs and quantitative measurement of production costs to provide a single cost figure. The use of dummy variables representing the different contracting models in non-parametric comparisons in the case study and the cost function analyses were the only way of combining the two forms of data to provide a comparative analysis (see section 8.2.3). However, these are poor proxies as the variation in production costs observed in these analyses fails to capture the actual transaction costs and therefore do not reflect the full picture.

8.4. Implications of the results

The findings of the thesis provide the first indication as to the shape of the cost function for HIV prevention services. They therefore provide a new building block in the evidence base for policy and planning and, in particular, budgeting and institutional design for large scale HIV prevention programmes. As indicated in Chapters 5 to 7, the findings underline the importance of improved information for planning and contract design in the areas of both production and transaction costs, and scale of activity, whether defined by the number of contracts or projects or the level of coverage. Scale matters when considering cost and efficiency. To raise coverage levels at the NGO level requires more personnel time, more supplies and more supervision. The observed fall in average costs as coverage rises indicates that the fixed costs are being shared over an increasing range of outputs. The analysis of financial cost that excludes the fixed costs incurred at the funding agency level implies that this may continue to high levels of coverage. However, when full economic costs are analysed a point of minimum efficient scale is observed. Increasing coverage beyond this level using the same production technology leads to a decline in efficiency. This may result from the increasing difficulty in reaching the next commercial sex workers or the limits of the existing investment in fixed cost. In the former case, in order to achieve full coverage, a project and its funding agency have to account and budget for the increase in average costs as coverage goes beyond a certain level. In the latter case, replication of the project with associated replications in fixed costs is likely to be a more efficient means of achieving increased coverage levels than simply increasing coverage within the existing project infrastructure.

In the case of programme scale and increasing service delivery units, there is rising complexity associated with setting up and managing increasing numbers of contracts.

To achieve smooth-running NGO projects with minimal leakage and optimal quality requires establishing strong, positive relations with NGOs, developing their capacity and monitoring their activities. The hierarchical and top down approach to planning and implementation that achieves this end in Andhra Pradesh can also be seen to restrict the development and evolution of projects that might need to adapt to the needs of a particular population, countering the ability of the NGOs to follow needs based planning led by their constituencies. On the other hand, as the funding agencies become more dependent on those NGOs whose capacity has developed with the programme, the NGOs position in the contractual relationship becomes stronger and they are likely to maintain greater influence over project design.

To sustain these hierarchical types of relationships requires an increase in total resources with each new HIV prevention project contracted for. As the number of contracts increases sharing the fixed costs of the funding or management agency over increasing numbers of outputs leads to lower average costs. Potentially, in the case of transaction costs, these can be further minimised by reducing the frequency of contracting through longer contractual periods and getting given NGOs to implement more projects to take advantage of trust and capacity already developed in existing NGO partners.

Driven by a dearth of information regarding the costs and efficiency of HIV prevention projects, this thesis set out to contribute to the evidence base on efficient ways to expand HIV prevention services and to better understand how and why costs might vary as activities are scaled up. Chapter 4 describes the response to the HIV epidemic in India and highlights the importance of the NGO sector and targeted HIV prevention services in the National Programme. Building the evidence to further develop this programme as its coverage increases in the form of ensuring adequate and appropriate funding levels and improving its governance is vital to prevent wastage of resources and achieve the coverage goals. The thesis helps address the information gaps in the National Programme by providing new and standardised data on costs of the delivery of HIV prevention services and suggesting methods for contracting out, among the existing models, that might be more efficient. The following sections summarise the , implications for the National AIDS Control Programme, generalisable policy recommendations and areas for further research identified in the thesis.

8.5. Implications for the National AIDS Control Programme

Planning the delivery of HIV prevention services in India takes place among a multitude of actors led by the National AIDS Control Organisation along with the health sector

and a number of donors including the World Bank and DFID. This thesis has implications for this planning process at both the sector policy and strategic management and the service delivery levels for the contracting out of particular HIV prevention services (see Table 2.3).

At the sector policy and strategic management level how the programme is governed is key. As the size of the programme increases, its management is likely to become more complex. The thesis provides evidence of funding delays, corruption and resulting poor quality in the delivery of services when programmes operate at scale. Adequate resources and changes in governance arrangements may be required to cope with these increasing complexities. Recommendations to NACO and its donors to address this issue, in the context of targeted HIV prevention projects, arising from this research are to:

- Encourage alternative forms of contractual governance that facilitate scaling up. Key features might include hierarchical control, while enabling flexibility, and minimising corrupt practices associated with large bureaucracies. Ensuring transparency and helping to minimise distrust through improving the contractual partners' expectations of each other (see section 2.7.2.1), as carried out by APSACS by introducing a third party contracting agency, appears to be an effective option for achieving this.
- Identify and, if they exist, take advantage of likely economies of scale with respect to the transaction costs through contracting with given NGOs to implement more than one HIV prevention project.
- Identify and, if they exist, take advantage of the economies of scale associated with investment in planning and capacity development by increasing the contractual period. Alongside an extension of the contractual period, it is likely that the system of annual renewal of contracts could be improved with a more transparent incentive based system dependent on third party evaluations and alternative measures of performance.

The thesis did not explore the options of alternative forms of governance such as delivery of services through the existing health system. However, in spite of the weaknesses found in the contractual models, it is unlikely that the health system would perform better. In contrast, contracting out was in fact a method used to avoid the bureaucratic delays of the health system and to take advantage of the not-for-profit sector's better ability to reach marginalised groups.

At the programmatic level planning needs to take into account the scale at the level of service delivery, in terms of service volume, as well as scale in terms of the number of delivery units. The results from the case study analysis in Chapter 5 indicate that relatively small scale commercial sex worker projects are more efficient than larger scale ones with an optimal coverage of around 1500 to 1800. On the basis of this implementation of CSW projects should be on a small scale of up to 1800 CSWs.

Chapter 6 and the financial cost data show that the optimal coverage for the HIV prevention projects with other target groups is higher and increases with output. The results from this analysis lead to recommendations of large scale targeted HIV prevention projects for truckers, slum dwellers and other high-risk groups.

It is also good planning that an implementing agency takes account of these variations in efficiency and ensures that the optimal level of efficiency is achieved given the required coverage level. Planning to expand coverage therefore requires understanding the cost function of services. It is recommended that NGO projects have better access to information regarding the nature of the cost function and use this information in the budgeting process.

The thesis found that information regarding the production and transaction costs of the targeted HIV prevention projects was not available in India, so limiting the evidence base with which effective planning can be carried out. NACO and its donors need to support national level research on the costs of different HIV prevention programmes, supported by adequate monitoring systems, to fill this information gap. Further data to be collected on a routine basis to feed into such research therefore might include:

- Information regarding economic costs, without which important contributions to the programme may not be budgeted for and a full understanding of the cost implications of different options are not obtained.
- Key identifiable transaction costs of different options for governance of service delivery.
- Context specific information on the nature of the target population, its size and accessibility, prices of inputs, in particular labour, and the level of capacity to deliver HIV prevention services as well as manage project budgets and report to a funding agency.

For targeted HIV prevention projects, this information could help identify the most efficient level of coverage for a particular project and whether it is more efficient to

increase coverage by reaching more people with the existing project or replicating the project in a new location.

A further finding of the thesis is that corruption is a major problem in which all parties in the contracting partnerships can be involved. It has led to wastage, seemingly poor quality or non-functioning projects and has reduced the potential efficiency of HIV prevention services. It is exacerbated by lack of trust between the contracting parties and delays in funds which pressurise implementing partners to show results when promised funds may not have been delivered. From the evidence presented in the thesis it is apparent that transparency and accountability on both sides of the contractual relationship between the SACS and the NGOs needs improvement and that potentially this could be achieved by:

- Developing more positive style relationships between the contracting parties with improved transparency and feedback to NGOs in the monitoring and evaluation process.
- Ensuring that the funding agencies are delivering on their obligations by making funds available on time or planning for these funding gaps and assisting the NGOs to do so.

These types of changes need reform at the level of the SACS and NGOs but also support from NACO and its donors, in particular to ensure smooth and predictable flows of funds.

8.6. Generalisability of results

The results of this thesis have the potential to provide useful lessons beyond both the states in which the programmes operate to national and international HIV prevention programmes, in particular where NGO contracts with government are an important component. In spite of weaknesses in the study including the small sample size which may not be wholly representative given the low response rate in the mapping survey, the weakness in some of the cost data, and the exclusion of the APAC contractual model, as well as the location-specific nature of cost information and qualitative data, there are a few important lessons that can be extrapolated beyond HIV prevention programmes for commercial sex workers and India to other circumstances.

As supported by theories of production and transactions costs and existing empirical evidence, scale impacts on both costs and contracting. As shown in the thesis, production and transaction costs vary with scale. As a result budgeting and resource requirement estimation need to take account of the planned scale of operation in terms

of coverage level or the number of contracts or projects being implemented, as do governance arrangements.

The variation in production costs implies that there are economies of scale to be taken advantage of, at least over a limited range of coverage, in targeted HIV prevention projects. However, the different results generated in the case study and the financial dataset analyses (see Chapter 6) suggest that the shape of the cost function is not generalisable across different types of targeted HIV prevention projects and highlights the importance of service-specific cost and scale information.

The research findings indicate governance arrangements must be appropriate for the scale of operation. In the case of HIV prevention services purchased by the public sector, governance arrangements for contracting with large numbers may require alternative forms of governance to those observed and noted in the transaction cost economics literature. Where programmes involve large numbers of contracts increased levels of resources and capacity are required to manage those contracts. This includes investment in ensuring transparency with reliable information systems and is likely to involve more formal and hierarchical forms of governance. In contrast where a programme manages smaller numbers of contracts, this is more likely to be able to operate effectively with relational contract structures that are more dependent on trust.

8.7. Areas for further research

In exploring supply side issues in the expansion of HIV prevention services through contracting out services to non-governmental organisations, this thesis has also identified three major areas for further research that would deepen the understanding of the costs of health services at different levels of operation.

Firstly, to see if these results are robust, further research on the nature of the production and cost functions of HIV prevention services across the full range of vulnerable groups targeted by these services as well as for other forms of HIV prevention is required, ideally using prospective data collection of economic cost and production data. This needs to explore variations across different service delivery models and their implications for quality, costs and efficiency.

Second, research on the response of different service providers and their funders to different incentives inherent in the contracting mechanisms is required to develop low

cost incentive systems that go further in ensuring quality and minimising corruption in the contracting out of HIV prevention and health services to NGOs.

Finally, a deeper understanding into the state of corruption in contracting out is required: how it works, what is the rationale behind it, what is the extent of its impact on the HIV prevention programmes and identification of methods for minimising it.

As the HIV epidemic continues its global devastation, there is an urgent need for scaling up of HIV prevention services. The coverage of HIV prevention programmes is being expanded with a number of different strategies. Planning and resource requirement estimation for these strategies relies on limited information regarding the costs and governance arrangements. This thesis broadens the evidence base on the costs of HIV prevention services. It presents an example from a specific context and programme of how both production and transaction costs vary as HIV prevention coverage is increased and appropriate governance arrangements are important in reducing waste resulting from poor quality services and leakage. The results underline the importance of including production and transaction costs at different levels of scale in the analysis of efficiency and cost function estimation. To make the best use of resources, these informational inputs should be considered in the design of the scaling up of HIV prevention services.

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Appendix 1: List of People Interviewed by State

New Delhi

Name	*Title*	*Organisation*
Mr Prasada Rao	Project Director	National AIDS Control Organisation
Mr Danikachalam	NGO Advisor	National AIDS Control Organisation
Dr Salil	Joint Director, Monitoring & Evaluation	National AIDS Control Organisation
Neelam Kapur	Joint Director	National AIDS Control Organisation
Navreet Kang	Deputy Director Finance	National AIDS Control Organisation
Mr S. Ramasundaram	Former Project Director	Tamil Nadu State AIDS Control Society
Dr Peter Heywood	Population Health and Nutrition Advisor	World Bank, Delhi
Carol Squire	Director	Population Services International
Dr Thomas Philip	Director	Family Health International
Stella Manoharan		Family Health International
Bethanne Moskov	Head of Infectious Diseases Dept.	USAID
Mr Sanjay Kapur	Project Manager, Office of Population, Health and Nutrition	USAID
Dora Warren	Consultant	Centre for Disease Control
Tim Martineau	Health Adviser	Department for International Development UK
Heiner Grosskurth –		Population Council/LSHTM
David Miller	Country Project Officer	UNAIDS
Swarup Sarkar		UNAIDS Inter Country Team

Maharashtra

Name	*Title*	*Organisation*
Dr Alka Gogate,	Project Director	Mumbai District AIDS Control Society
Dr Minni Khetarpal	Jt Director STI	Mumbai District AIDS Control Society
Mr Narveka	Deputy Director	Maharashtra State AIDS Control Society
Lalita Mahajan	NGO advisor (temp)	Maharashtra State AIDS Control Society
Mr Girase	Financial controller	Maharashtra State AIDS Control Society
Mr Vaiyadanathan	Director	AVERT
Rajeswari Balaji		CEHAT
Ravi Duggal		CEHAT
Binodh Mahanty	Consultant	
Vivek Diwan		Lawyer's Collective
Shilpa Merchant		Populational Services International, Mumbai
Seema Shroff	Monitoring and Evaluation (ex NGO advisor Maharashtra State AIDS Control Society)	Asha BMC

Tamil Nadu

Name	*Title*	*Organisation*
Dr. Bimal Charles	Director	APAC
R. Christodas Gandhi	Project Director	Tamil Nadu State AIDS Control Society
Sebastian Jayaraj	NGO adviser	Tamil Nadu State AIDS Control Society
P. Krishnamurthy	Director (Ex-director APAC/ ex-programme officer at TNSACS)	Dept. Public Health
Mr Pari		Shantoshi Social Sciences Research and Welfare Centre
Mr Sampath	Director	VEEDO
Dr Mono Rama	Director	CHES, Chennai
Mr Ramkumar	Director	CSR, Nagercoil
Mr Winsley Clement	Project Coordinator	Palmyrah Workers Association
Dr Chandramouli,		Centre for Social Development, Kanyakumari
Dr Sucila Pandian		CAST, Tirunelveli
Mr Cletus		SCAD Gramodyah
Mrs A. Murphy		Teddy Trust, Madurai
Mrs Jaya Karupayee		Mercy Trust, Madurai
Mr David Thiagarajan		IMAGE, Madurai
Mr Hariharan		ICWO, Chennai
Dr. Ravi Raj Williams		Christian Council for Rural Development and Research

Andhra Pradesh

Name	*Title*	*Organisation*
Ms Rachel Chatterjee,	Principal Secretary Health	
Ms Damayanthi	Project Director	Andhra Pradesh State AIDS Control Society
Brahma Prakash	Team Leader	Technical Resource Unit
PC Kasinath	Consultant – training	Technical Resource Unit
Dr Shashikala	Project Coordinator	Technical Resource Unit
Sharavan Kumar	Zonal Monitoring Officer	Technical Resource Unit
Roshan Kumar	Director	SEEDS – Social Educational and Economic Development Society
G. Daniel Raju	Project Coordinator	SEEDS – Social Educational and Economic Development Society
KSL Chowdary	Project Director	ARISE, Rajamundry
Venkatesa Rao	Director	CHANGES, Kakinada
S.P. Reddy	Executive Director	UMA Manovikasa Kendram
Maheshwari	Project Coordinator	Lepra India

Karnataka

Name	*Title*	*Organisation*
Dr James Blanchard	Consultant	CIDA support to Karnataka State AIDS Control Society and Rajasthan State AIDS Control Society

Appendix 2: Tamil Nadu mapping survey questionnaire

FOUNDATION FOR SUSTAINABLE DEVELOPMENT

IC&SR Building, IIT (Madras)
Chennai-600 036, Tamil Nadu
Tel: 044 257 0338; Fax: 044 257 0559

XXX Date XXX

The London School of Hygiene and Tropical Medicine, in collaboration with the Foundation for Sustainable Development (FSD), at the Indian Institute of Technology (Madras), and under funding from the Wellcome Trust (UK), is initiating a research project to analyse the resource requirements for scaling up HIV prevention interventions at the state level in India.

Scaling up targeted HIV prevention activities has been identified as a priority by the National AIDS Control Organisation (NACO) of India to halt the rising incidence of HIV. To ensure adequate funding, planning for this requires an estimate of the resources required to do so. The study will examine this by:

- describing HIV transmission patterns and current levels of intervention coverage
- calculating costs of targeted HIV prevention interventions in India
- analysing how these change as activities are scaled up
- using this information to estimate resource requirements for HIV prevention

This survey forms part of the first phase of the study and is being used to establish levels of coverage and nature of organisation of HIV prevention services in the two states. We would like to invite you to help in our enquiries and complete the questionnaire. By answering the questions on the nature of the HIV prevention services provided, the organisation structure, the main sources of funding and systems for monitoring and evaluation, you will help us establish a complete picture of the current level of HIV prevention activities in Tamil Nadu today.

All information provided by your organisation will be kept confidential. Only our research team will have access to the information during the data collection process. The report from the survey will be made available to you prior to circulation.

In addition to completion of the questionnaire we would be grateful if you could provide us with any background documentation or project reports that you feel would be useful to our survey.

A sample of organisations will be selected for the second phase of the study, in which cost analyses of the HIV prevention services will be carried out. Please can you indicate to us whether you will be interested in participating in this survey.

We would be grateful if you could return the completed questionnaire along with any attachments to us at the Foundation for Sustainable Development, before xxxxxx.

With many thanks for your kind co-operation and time for filling out the survey.

Yours sincerely,

Lorna Guinness
Research Fellow, London School of Hygiene
& Tropical Medicine
email: lorna.guinness@lshtm.ac.uk

Professor VR Muraleedharan
& Shanthi Sankaralingam
Indian Institute for Technology, Madras

A. CONTACT DETAILS								
A1	Name of Organisation:							
A2	Address:							
A3	City			A4	District			
A5	State			A6	Zip code			
A7	Phone		A8	Ext		A9	Ph. 2	
A10	Cell		A11	Fax		A12	email	
Organisation Head								
A13	Given name			A14	Other name			
A16	Designation			A15	Title			
Contact person (if different)								
A17	Given name			A18	Other name			
A19	Designation			A20	Title			

B. OVERALL DESCRIPTION OF ORGANISATION (BOTH HIV AND NON-HIV RELATED ACTIVITIES)			
B.2. In what year was this organisation established?			
B.1. Please describe the mission, main objectives and projects of your organisation as a whole.			
Mission:			
Objectives:			
Projects:			
B.3. Which of the following best describes your organisation? (Please tick one)			
Registered society		Registered trust	
Other, please describe:			

B.5. How many people work full-time, part-time and as volunteers for your organisation (for both HIV and non-HIV-related activities). (Alternatively please provide a staff list with staff designations):

	Total	HIV-related activities
Full time:		
Part time:		
Volunteers		
Other:		

C. HIV-RELATED ACTIVITIES

C.1. Please list all the HIV/AIDS projects that your organisation is implementing or has implemented, the target group for each project and the project(s) start and completion dates.

Project name	Target group	Start date	Completion date

C6a. For each project and each project site, please provide the following information in the table overleaf:

a) the project name
b) the project sites of the HIV projects
c) whether the sites are urban or rural
d) the activities/services provided at each project site
e) start date for each of the activities at each of the sites
f) whether the activities are ongoing (and if not the completion date)
g) number of TG members reached by each activity
h) year to which the data in (g) applies
i) estimate of the numbers of the TG at each of the project sites – for a trucker intervention please give the estimated number of the TG passing through the project site(s) each day

C.4. Are these HIV/AIDS-related projects based in rural or urban areas (please tick one box for each HIV/AIDS related project site that you list):

(a)	(b)	(c)			(d)	(e)	(f)	(g)	(h)	(i)
Project Name	**Project site**	**Please tick one:**			**Activity (eg needs assessment, project components and subcomponents, camps, IEC campaigns etc),**	**Start date of activity**	**Are the activities ongoing ***	**Number of TG reached**	**Time period for which data collected in (g)**	**Estimated number of TG living in area ***
		Urban	**Rural**	**Both**						

*For those activities that have been completed, please state the completion date.

C.9b. Please list in the table below, how many peer educators work on each HIV-related project and to which target group do they belong

Project site	Peer community eg sex worker/ prisoner/ MSM/ madames	Number of peers from each peer group

C.10. What type of incentive is provided to the peer educators? (please tick as appropriate)

Travel and meeting expenses		Regular payment:	in cash	in kind
How often is the regular payment made	Monthly / Quarterly / Other			

C.7. Does your organisation work with partners/ collaborating organisations for referrals or capacity building? E.g. government health or education services, private practitioners or pharmacies, NGOs delivering health care services, training institutions. (please tick only one) – this does NOT include funding agencies.

YES		NO		

C.8. Please list the project partner(s) and give details of how they facilitate activities (name & contact details, nature and period of partnership, services provided)

Name and contact details of partner	Time period of partnership	Services provided by partner and nature of partnerships

C.11. Please list the training activities that staff of this organisation attended in the last year, the training location, the date and time period of the training and the number of attendees. Please attach a separate sheet if required.

Training activity	Location	Date	Number of attendees	Duration (no. of days/weeks)

C.12. Please list the training activities (this does NOT include IEC activities/campaigns) that the organisation carried out/facilitated last year, the training location and the number of attendees. .

Training activity	Location	Date	Number of attendees	Duration (no. of days/weeks)

C.13. If you were able to expand your activities in order to *ensure increased behaviour change*, what would you plan to do?

C.3a. Are the HIV/AIDS related activities integrated with the other work of your organisation?

YES		NO	

C.3b. If Yes, please describe how the HIV prevention services are integrated into the other activities.

D. FUNDING

D.2. What is the total annual expenditure of your organisation as a whole (including both HIV & non-HIV activities):

D.3. For each of the HIV/AIDS related projects, please list the HIV-related project, the name(s) of the donors, the total donation and the time period the funding covers

Project funded	Donor	Total funding for each year (since project inception)	Funding period Please specify dates funding commenced and completed

D.1. For each of the HIV/AIDS related projects, what was the total expenditure in the most recent financial year? (please include any NGO contributions)

Name of project	Total Expenditure including NGO contribution	Expenditure period If not most recent financial year

D.4. Do the HIV/AIDS-related projects receive any donations in-kind? Eg condoms, donated equipment (Please tick one)

YES		NO		

D.5. If yes, please describe the donations, funding source and give an approximate value (or provide documentation if available).

Donation	Funding source	Approximate value	Funding period Please specify dates funding commenced and completed

D.6a. If your organisation carries out social marketing, please state:

Brand(s) of condom		Average price per piece:	_____ Rs.

D.6b. What is the total revenue from social marketing in most recent financial year: _____ Rs.

D.7a. Does your organisation provide clinical STD services: (please tick one) Yes | | No | |

D.8a. What is the price charged for: STD consultation _____ Rs STD drugs _____Rs.

D.6b. What is the total revenue from STD services in most recent financial year: _____ Rs.

E. MONITORING AND EVALUATION			
E.2a. Please provide a list of the process indicators compiled for monitoring of HIV/AIDS related activities.			
E2b. Please describe any other forms of monitoring and evaluation carried out for the HIV/AIDS related projects?			
Internal		External	
E3. Please list any research or evaluation studies that have been carried out in relation to the HIV activities of your organisation eg mapping of target groups, behavioural surveys (baseline or follow-up), cost analysis, sentinel surveillance etc			
E5. How frequently are account statements generated for: (please delete as appropriate)			
HIV-related projects	Monthly / Semi-annually/ annually/ other….. please state:	Organisation as a whole	Monthly / Semi-annually/ annually/ other….. please state:
E6. Are the accounts for the HIV/AIDS related projects reported separately to the rest of the organisation? (please tick one)			
YES		NO	

F. NEXT STEPS

In the second phase of our study, we will be carrying out detailed cost analyses at a sample of interventions in this state. In the cost analysis we will calculate average costs of delivering the HIV prevention services and describe how resources are allocated in the implementation of these activities. In this way, the cost analysis can help with budgeting and future planning and can help with improving the efficiency of the organisation. In order to carry out the cost analysis, we will seek access to data on the activities of the organisation, the outputs achieved and financial information and carry out interviews with NGO staff. The study is being carried out for scientific research purposes only. All data pertaining to your organisation will be kept confidential and the reporting of data relating to your organisation will be made available for comments to you prior to circulation.

We would like to know if you would be interested in participating in this next phase of the study. Please tick one of the boxes below and return this form with the questionnaire.

❑ We would like to participate in the cost study if selected.

If so, we would appreciate it if you could tell us what you will require from us in order to establish an agreement for the cost study to take place:

_____

_____

❑ We are NOT interested in participating in the cost study. Please state why

_____

_____

Signature _____

Name (please print) _____

Designation _____

Organisation _____

Date _____

WE WOULD LIKE TO THANK YOU FOR YOUR KIND COOPERATION IN COMPLETING THIS QUESTIONNAIRE

Appendix 3: Andhra Pradesh mapping survey questionnaire

Economic Analysis of Scaling Up HIV Prevention Interventions

The Foundation for Sustainable Development (FSD), at the Indian Institute of Technology (Madras) with the assistance of the London School of Hygiene and Tropical Medicine is carrying out a research project to analyse the resource requirements for scaling up HIV prevention interventions at the state level in India.

We would be grateful if you would complete the following and return it to us by tomorrow morning to assist us in the above research project.

Organisation name: _____

District of intervention: _____

What date was your organisation established _____/_____/_____

Does your organisation hold an FCRA certificate? Yes/ No

What is the total organisation expenditure for all projects? _____

What is the total number of staff working on all projects (excluding executive committee members)? _____

What year did you start work on HIV-related activities (if different from APSACS targeted intervention)? _____

How many intervention areas do you cover (NOT the number of project sites or halt points)? _____

What is the average distance per day travelled by an outreach worker at your project? _____

What were the targets and achievements for your APSACS targeted intervention in the contract years 2001/02 and 2002/03?

	2001/02		2002/03	
	Target	Achieved	Target	Achieved
High risk group reached (number)				
STDs identified				
STDs treated				
Condoms distributed (free/ social marketing)				
Number of target areas				

With many thanks for your kind assistance.

Lorna Guinness, London School of Hygiene & Tropical Medicine

Appendix 4: Letters of permission for study

Letter from National AIDS Control Organisation

भारत सरकार

J V R PRASADA RAO
Special Secretary
Tel. : 301 7706
338 5331
Fax : 371 1746

भारत सरकार
स्वास्थ्य विभाग
स्वास्थ्य एवं परिवार कल्याण मंत्रालय
नई दिल्ली — 110 011

GOVERNMENT OF INDIA
DEPARTMENT OF HEALTH
MINISTRY OF HEALTH & FAMILY WELFARE
HIRMAN BHAWAN, New Delhi - 110 011
E-mail : nacodel@vsnl.com

January 22, 2002

Economic analysis of resource requirements for HIV prevention at the State-level in India.

Dear Ms. Guinness,

Many thanks for coming to meet me and introducing NACO to the above research project that you are working on with Professor Muraleedharan at IIT, Madras.

NACO is very much in support of the analysis and hope that our partners in HIV prevention in India will cooperate with you as far as possible. We look forward to hearing about your progress and seeing the final results.

With regards,

Yours sincerely,

(J.V.R. Prasada Rao)

Ms. Lorna Guinness
Health Policy Unit
London School of Hygiene and
Tropical Medicine
Keppel Street, London WC1E 7HT

Letter from Tamil Nadu State AIDS Control Society

TAMILNADU STATE AIDS CONTROL SOCIETY

(A Society Registered under the Tamilnadu Societies Registration Act, 1975)

417, Pantheon Road, Egmore, Chennai - 600 008

K. DEENABANDU, I.A.S.,
Project Director & Member Secretary

Date : 4.12.2002

TO WHOMSOEVER IT MAY CONCERN

*This is to certify that "The London School of Hygiene" and "Tropical Medicine" in collaboration with the "Foundation for Sustainable Development (FSD)" at the Indian Institute of Technology (Chennai) is carrying out the research project viz., **"Economic Analysis of Scaling up Targetted Interventions".** FSD is analysing the programme, financial cost and effectiveness of the above research project. Kindly provide the following assistance to them :*

- ☆ *Programme achievements*
- ☆ *Routine monitoring and data collection from the working area.*
- ☆ *Outputs and expenditure, reporting systems.*
- ☆ *Projects documents*
- ☆ *Interviews with project staff.*

(K. Deenabandu)
PROJECT DIRECTOR

T.P. Road : 819 0961, 819 4912, O/P : 819 0891, 819 0567
Fax No. 91-044-8190261 E-mail : tnsacs@tn.nic.in web site : http://tnsacs.tn.nic.in

Letter from Chennai Corporation AIDS Prevention and Control Society

CHENNAI CORPORATION AIDS PREVENTION AND CONTROL SOCIETY
Regn. No 219/98
82, Thiru. Vi. Ka. Salai, Mylapore, Chennai - 600 004
Ph:24986514, 24990081 Fax : 24987471 Email : chennaiaids@vsnl.net

From

Dated: 13.10.03

Thiru. V.P. VijayaKumar, I.A.S.,
Commissioner, Chennai Corporation/President,
Chennai Corporation AIDS Prevention And Control Society,
82, Thiru-vi-ka Salai,
Mylapore, Chennai - 600 004.

To

Prof. V.R. Muralidharan,
Foundation for sustainable development,
IC&SR Building,
IIT (Madras),
Chennai - 600 036.

Dear Prof. V.R. Muralidharan,

Sub: CAPACS – Economic Analysis of scaling up targeted intervention – Extension of support – reg.

I learn that the research project you are working is in collaboration with the London School of Hygiene & Tropical Medicine.

CAPACS will extend our full co-operation to you and your project as far as possible. I have also requested the staff of CAPACS to give all support and help to Mrs. Bhuvaneswari of IIT, Madras. We understand that the above analysis is only for research and final results will also be communicated to CAPACS.

We look forward to hearing about the progress of your project and seeing the final results.

With regards.

Yours sincerely,

13.10.03.

For Commissioner

Letter from UK Department of International Development

FAX MESSAGE

DFID Department for International Development

To: **Ms. Lorna Guinness**
Fax No: **044-2200559**
Organisation: **Health Policy Unit**
London School of Hygiene & Tropical Medicine

From: Tim Martineau
Date: 27 February 2002
Number of pages (01)

DFID India
British High Commission
B28, Tara Crescent
Qutab Institutional Area
New Delhi 110 016

Tel: (91 11) 652 9123
Fax: (91 11) 652 9296
Email: t-martineau@dfid.gov.uk

Dear Lorna,

Thanks for coming and meeting with me to discuss your work, looking at the financial and institutional requirements for scaling up targeted interventions. I understand that you had originally planned to work in Tamil Nadu and Maharashtra, but that the latter does not have sufficient number of interventions. You have proposed moving to look at AP.

I suggest that you write to Mr Rao concerning this issue. Certainly DFID has no problem in sharing past financial data and monitoring information with you. After writing to Mr. Rao I suggest you contact Ms. Damayanthi (PD APSACS). You can then hopefully liaise with the TRU for more up to date information and direct contact with the NGOs.

I have copied this to Mr. Rao and Ms. Damayanthi.

Best regards,

Tim Martineau
Senior Health Adviser

Appendix 5: Costing questionnaire

Instructions to the Interviewers

Aim of the questionnaires and records review:

To obtain information on:

1. Financial and economic costs of the intervention from the NGO's perspective – in order to complete the HIV costing worksheets
2. To understand the organisation and financing of the services
    - who is doing what, where and with what financing
3. To understand the process of contracting and the impact on the organisation and its services:
    - costs of developing and designing the contract, monitoring and evaluation, capacity building/ training, costs of contract renewal and costs associated with ensuring smooth running of the project (eg fund flows)
    - level of investment specific to the project (i.e. capital costs and capacity development that are unlikely to be useful in other activities)
    - level of accountability and who is accountable to who; level of dependency
    - rationale for implementing the project
    - nature of the relationship b/w the NGO and the contractor – is this trusting and positive or is it difficult?
    - effectiveness of the contracting mechanism – what are the positive aspects and what are the disadvantages
4. To understand the role of NGO partners (e.g. peer educators, health care providers etc) in the implementation of the project
    - Contribution to the project (time and value)
    - Payment by the project
    - Rationale for and benefits gained from the project

Interviewees:

Section 1: Interview with project director or project manager

Please read the introduction to the interviewee in and note the name of the interviewee, date of interview, your name and the organisation at the top of the section. Please record

these interviews and fill out the answers on the questionnaire or a separate sheet where necessary. (Q.28 needs to be asked to both the PM and PD).

Section 2: Project manager and/or finance officer

The records review will be sent in advance to the organisation. If not it should be shown to the project director who can then direct you to the relevant interviewee and records. The information should be collected for the most recent year for which information is available (which should be the start up period of the project) as well as for the start up activities i.e. proposal development/negotiation; target group enumeration/identification; training; IEC development; system development etc.

Section 3: Peer educators

For the individuals listed in the volunteer and peer educators list we need to find out the value of this contribution. Interview all the peer educators. If there are more than 10 peer educators, aim to interview 20% of the peer educators (whichever is the higher number) based, where possible, on types of peer educators/sex workers, geographical area and/or income group.

Introductory Note

To be read to the staff at the NGO as an introduction to the interview(s) and record review

The Foundation for Sustainable Development (FSD), at the Indian Institute of Technology (Madras) is carrying out a research project to analyse the resource requirements for scaling up HIV prevention interventions at the state level in India. The project is funded by the Wellcome Trust (UK) and support is provided by NACO and TRU/APSACS. This visit to the NGO is part of the 2nd phase of the research in which we are carrying out a cost analysis of the HIV prevention work. We would like to document the activities that are carried out as well as the resources required to implement these at the NGO and contract management level.

We would therefore like to ask you to about the following types of information:

1. Routinely collected monitoring data on activities, outputs and finance for the targeted interventions.
2. Documentation and valuation of financial and non-financial outlays by the contracting agency using project documents and interviews.
3. the processes involved in contracting with a funding agency for the implementation of HIV prevention projects

All information provided will be used for research purposes only and information not released without prior permission. Only our research team will have access to the information during the data collection process.

Once we have completed the analysis we will feed this back to you for your comment. The report from the analysis will be made available to you prior to circulation.
To collect the information we would like to interview the project manager and the finance officer about the activities, financing and contracting processes of the project. The process is in 2 stages – 1st: an interview about the activities and processes; and 2nd: a records review. We would also like to interview the peer educators and health care providers working with your project.

NGO:_____ For research purposes only

We may need to spend some time going over project documents and the records or if you are happy with this make some photocopies or take floppies of these. We will pay for or make reimbursements for any photocopies we take.

The interviews with the project manager and the finance officer may take some time and may include follow up interviews for clarification. We appreciate your patience in this. The areas covered by our analysis are as follows:

- Activities and history of project
- Start up activities and capacity development
- Monitoring, evaluation and technical assistance
- Co-ordination with funder and parent organisation
- Personnel
- Supplies
- Building operating and maintenance
- Transport and vehicle costs
- Expenditure and outputs of the NGOs

NGO:_____ For research purposes only

Section 1: Project Description

Name of Organisation: _____

Name of Interviewee: _____ Designation: _____

Name of Interviewer: _____ Date of Interview: _____

Background to the NGO

1. Please can you give me a brief background of the organisation:
   - What are the organisation's overall objectives?
   - What are the other programmes and funding sources alongside the targeted intervention (TI)?
2. What date was the organisation established? _____
3. What is the total annual expenditure of the organisation as a whole – for the most recent financial year (please can you provide a list of all projects and all funding sources)? _____
4. Does your organisation hold an FCRA certificate? Yes No; If so, for how long have you been working with international funders? _____years
5. What is the total number of staff working in the organisation (as a whole)?

Full time_____ Part time_____ (include paid staff only)

6. Was the targeted intervention (TI) the first HIV programme implemented by your organisation? If not, when did your organisation first start working on HIV-related activities? Please describe these activities and the funding sources.

Targeted Intervention Activities

7. What are you required to do by the funder/ contracting agency to implement the TI? (If multiple sources of funding please describe for each agency)
8. When was/were the contract(s) you hold now awarded? _____
9. How long have you been holding this/these contract(s)? _____
10. Is this an extension of an earlier contract? Yes No
11. If so when was the first contract awarded? _____

12. Please can you describe the other activities that took place in order to enable the start up of the intervention under this contract (expenditures, frequency, dates, people involved), for example:
    - Proposal development
    - Needs Assessment (if available please provide report)
    - Training
    - Contract negotiation, proposal submission and review
    - Project visits to and by funding agencies/consultants
    - Development of management information systems.
    - Other - please specify
13. When did you start implementation of the targeted intervention (TI)?_____
14. When (which date) would you say the TI was fully operational and providing all the services as planned? i.e. What would you say was the start up period for the intervention? _____
15. What is the duration of the contract (in months)? _____
16. Do you expect the contract to be renewed? Yes No
17. If so how many months do you expect to work on this project from the start of the intervention? _____
18. How are the inputs (budget), outputs and activities specified in the contract? Please can you describe these. (Please specify the target for the TI outputs).
19. What is(are) the target group(s) that you work with under the TI? (in theory and in practice). If sex workers please describe the type of sex workers that you work with (eg brothel based, street based, lodge based etc)_____
    _____
20. What is the total number of the target population that you reach/ are in contact with at any particular point in time? _____
21. What proportion of the total sex worker population in this area, do you think this is?_____

22. Please can you describe in detail the activities carried out under the project such as Behaviour change communication, Condom promotion, STI management, Enabling environment, other).e.g.
    - do you work with partners in the community (peer educators, physicians etc) and are these partners trained by your organisation?
    - is there condom social marketing? Or is condom distribution free
    - do you provide STI treatment? If not who does? How is treatment financed (does the project provide support?)
    - do you carry out community mobilisation activities (eg family health awareness campaigns, festivals etc)
23. Was investment in capital items such as equipment, computers, buildings etc required? If so, who funded these and which of these (and how many) are required for monitoring of the contract (eg computers)?
24. Did staff attend training during the implementation? Is this sufficient? Why

Staff

25. How many working days are there in (a) the week and (b) the year for your organisation? (a) _____ (b) _____
26. Are there any criteria for staff recruitment laid down by the purchaser? What are they?
27. What are the responsibilities of the field staff? Do your field staff operate according to a schedule/ timetable. If so please can I see a copy? In practice do you keep to this schedule. If not, how much time each week is allocated to:
    - field work (i.e. direct service provision)
    - reporting (i.e. writing up daily activities, compiling monthly reports)
    - staff meetings
    - other activities (please specify)

28. What are your responsibilities under the targeted intervention? (this should be asked of both the project manager & project director) ?

PD_____

PM_____

Do you work full time on the targeted intervention? PM: Yes/No PD: Yes/No

If not, what are your other responsibilities/ activities?

PD:_____ PM: _____

How many days are spent working on the targeted intervention each month?

PD:_____ PM: _____

29. For the staff (include all staff both working directly on the project and those elsewhere in the NGO) and any executive board members involved in the project, please can you tell me: (ask the project director or project manager)
    - What are their responsibilities towards the targeted intervention?
    - Do they work full time on the targeted intervention? If not:
    - What proportion of their time do they spend on the TI?/ What is the number of days they spend on the project?
    - What is their salary or average monthly income?

30. Please can you tell me about the time spent by the peer educators on the project activities:

a) How many peer educators work on the project at any point in time? _____

b) Are the peer educators paid? Yes No

c) If so how much and how frequently? _____

d) What other incentives (monetary and monetary), if any, do you provide to the peer educators? _____

e) How was the system of incentives developed? _____

f) Are the payments and incentives sufficient? Why? _____

g) How often do each of the peer educators attend meetings with the NGO? And how long are each of these meetings? _____

h) On average how long are the peer educator contacts with the target group?_____

i) What is the number of contacts with the target group each of the peer educators had in the last year? _____

j) At what time of day do the peer educators carry out their work? Is this during working or leisure time (i.e. what would they be doing otherwise)?_____

k) How long (in months) do you expect each peer educator to work with the project? Why? _____

l) What is your relationship like with the peer educators? Would you say it was good and strong or difficult? Please explain why? Would this be different if they stayed longer with the project?

31. Please can you tell me about the time spent by the volunteers working on the project activities in the last financial year:

a) How many volunteers are working on the project? _____

b) How many working days do they work in total for the TI? _____

c) Do you provide them with any gifts/incentives? If so please describe and what is the value of these? _____

Payments and auditing

32. What is the most recently completed financial year?_____

a) what was the budget for this period? _____

b) for the current contract? _____

(Please provide the budget and its breakdown – in electronic format if possible)

33. Please can you describe how the NGO is paid?

- How frequently are funds released?_____
- On what basis? (e.g. is this subject to submitted reports)_____
- What proportion of funds are released at each instalment _____

34. What is the expenditure:

a) for the most recently completed contract period _____

b) to date under the current contract? _____

(Please provide the expenditure/financial statement and its breakdown – in electronic format if possible – please specify the time period)

Monitoring & Evaluation

35. Please describe the mechanisms used for reporting to the donor/purchaser:
    - How frequently do you submit reports to the contractual partner? In theory and in practice?_____
    - What are the requirements for each of these reports?_____
    - How many registers do you have to maintain to fulfil these obligations?
    - What are the implications of these reports for your activities – i.e. how much time do you and your staff spend in preparing reports; which staff are prevented from carrying out normal daily activities and for how long?_____
    - Has the reporting system changed since you started with the contractual partner? In what ways? (e.g. timing, content) What were the implications of these changes?_____
36. Please describe any other monitoring mechanisms:
    - Do you receive monitoring visits? If so, please can you tell me who visited over the life time of the project and when they visited for each of these visits?_____
    - What were the implications of this/these visits for your organisation i.e. did you and your staff spend time in preparation and in hosting the visit; which of your staff were prevented from carrying out normal daily activities and for how long?_____
37. Are there any other measures taken by the purchaser for monitoring? Eg for billing, cost control, quality assurance, community consultation
38. Do other parts of your organisation provide support in the monitoring and management of the contract? If so who is involved and how much time is spent in these activities?
39. Have you been provided with any training or support to help with the reporting system? Was this training effective? Why?
40. Do you carry out behavioural surveys to understand if behaviour change has taken place within the target population group? If so, please can I take a copy of survey reports. If not, do you have any other mechanism to measure behaviour change? Please can you describe this.

41. Do you have information on the HIV prevalence among the targeted group or the district within which you work? If yes, please can I take a copy of the report from these surveys. Yes No

42. Please can I see a copy of the contract for the targeted intervention (i.e. the contract you hold with the funding agency).

Section 2: Records Review

Name of Organisation: _____
Name of Interviewee: _____ Designation: _____
Name of Interviewer: _____ Date of Interview: _____

Please can I look at the records or registers to see the following: (these data will be used to enter into and complete the accompanying tables)

1. Please provide copies of the monitoring reports (financial, programme activity and output reports) – in electronic format if possible - for the most recent financial year. (usually in the form of monthly technical reports)
2. Please can you provide me with the budget(s) and expenditure reports, broken down by line item, for the intervention since its inception.
3. Please can you also provide the dates and amounts of all fund releases since the project inception.
4. A list of the project sites that you work at and the estimated size of the different target population(s) at each site for the most recent financial year. (If individual site data not available please provide total).

Site		Population size (if known) breakdown by population group	Target to be reached (current contract) breakdown by population group
A.	_____	_____	____
B.	_____	_____	____
C.	_____	_____	____
D.	_____	_____	____
Total:	_____	_____	____

5. A list of all the buildings that are used for this project at each of the project sites:
   - Please include headquarters, any storage facilities, field offices, project offices etc)
   - How many square feet/ metres are each of these buildings?
   - How many square feet are used by the TI?
   - What is the rental charge for each of these buildings?
   - Is this the normal market value for such a property? If not, do you have an estimate of the true market value.

6. A list of the staff, peer educators and volunteers working on the project in the most recent financial year (please include ALL staff – including those paid through the NGO contribution – eg sweepers, drivers and other support staff – and ALL volunteers – including members of the executive committee) and their:
    - Designation
    - Qualification
    - Profession (for peer educators and volunteers)
    - Date started work with organisation
    - Date left organisation (if applicable)
    - Salary and any benefits in most recent financial year
    - Allowances/ incentives in most recent financial year
7. A list of the health care providers (physicians/ RMPs) working with the project to provide management of STI treatment and:
    - Their qualifications
    - Consultation fee for project referrals
    - Consultation fee for non project referrals (if different)
    - The name, date, duration, location and related expenses of training provided to them in relation to the STI services provided under the project
8. A list of all the capital items and equipment (i.e. those items whose expected life is greater than 1 year) used by the project, their purchase price, year of purchase and expected life in years (please also include items that are part of the NGO contribution or have been donated to the project. Do not include items with a very low value eg less than 1,000 Rs)
9. A list of all the vehicles used by the project (including provided NGO contribution and personally owned), their purchase price and year of purchase.
10. The vehicle log books and/or travel expenses/travel claims/other claims (eg communication) to ascertain travel costs incurred by the project and field staff.
11. Condom stock records - for most recent financial year:
    - the number of condoms received at the project (all sources)
    - the number of condoms distributed in the most recent financial year.
    - the number of condoms sold in the most recent financial year.

12. STI referral records – for most recent financial year:

- the number of STI cases referred
- the number of STI cases treated
- and for each STI patient referred

– the diagnosis/symptom; qualification of health care provider (egMBBS/RMP)
– consultation fee & drug charge for each patient (both NGO & patient expenses); normal (unsubsidised consultation fee if different.

13. A list of the IEC materials and training materials are used for education of the target group/training in the most recent financial year.

Year & IEC material *Eg Flyer*	Source *TNSACS_ __ _ _*	Cost of production *2000, Rs 2500 for 20,000*	No. used *_ _5,032*
_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _
_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _
_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _
_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _
_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _

14. For the most recent financial year, the bills/receipts for:

- building rent
- utilities (water, electricity, gas)
- communications (phone, fax, internet)
- building maintenance (cleaning, fuel, etc)
- vehicle maintenance (if applicable)
- stationary and other office supplies/expenses (eg photocopying)

15. All the training activities that your staff have attended since the start of the contractual process for the TI (include needs assessment):

- Related expenditures (travel, subsistence, food, fees)
- Number of attendees from your organisation
- Name, date, duration and location of the course

16. All the training activities that your organisation has provided (including peer educator training) since the project start including:

- Related expenditures (travel, subsistence, facilitator fees, food, venue)
- Number of external facilitators
- Number of attendees
- Name, date.duration and location of course

17. All the start up activities that were required to implement the project (eg project proposal development, contract negotiation, needs assessment, enumeration of sex workers, identification of peer educators, development of reporting systems)
    - Activity name and date
    - Inputs to the activity (staff time, travel, supplies, communication etc)
    - Related expenditures

18. All the BCC (behaviour change & communication), advocacy and other events (eg family health awareness campaigns, melas etc) held by your organisation in the last financial year
    - Related expenditures (travel, subsistence, facilitator fees, food, venue)
    - Name, date, duration and location of the event
    - Number of external facilitators
    - Number of attendees

19. All the monitoring and review visits that have taken place since the start of the contract tendering for the project (including monitoring visits to AND from the funding agency, review teams or consultants) including:
    - Related expenditures (travel, subsistence, food)
    - Location of the visit, date and duration of the visit
    - Number of visitors

TNSACS Records Review

Please can I look at the records or registers to see the following for the time period from the start of NACP2 until present:

Background Information

1. Annual budget and releases for TNSACS as a whole & targeted interventions since start of NACP2
2. Annual expenditures for TNSACS & targeted interventions during NACP2
3. List of NGOs under contract with TNSACS each year and their contractual period(s) (i.e. start date and end date plus renewal date if appropriate)
4. Annual budget, fund releases and fund release dates for NGOS working on CSW interventions during NACP 2
5. Annual expenditures by NGOs working on CSW interventions – by NGO and activity – during NACP2
6. Outputs (from technical reports) of NGOS working on CSW interventions by NGO
7. A copy of the contract and any guidelines that you and the NGOs are required to follow in the contractual process including a description of the monitoring and evaluation process.

Costs of monitoring and contract management

8. A list of the staff and volunteers working on the project in the last 2 years (please include ALL staff – eg sweepers, drivers and other support staff) and their:
    - Designation
    - Qualification (if applicable)
    - Date started work with organisation
    - Date left organisation (if applicable)
    - Salary and benefits (including staff development) in most recent financial year
    - Allowances/ incentives in most recent financial year

9. A list of the IEC materials distributed for use in education of the target group as used by CSW interventions during NACP2.

IEC material distributed	Source	Year & cost of production	No.
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

10. A list of the supplies used or distributed to the NGOs working on CSW interventions eg condoms, drugs, stationary etc in the last financial year.

Supply date	Quantity used	Unit price	Purchase
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

11. A list of the training that has been provided or facilitated by your organisation for the NGOs
    - Related expenditures (travel, subsistence, facilitator fees, food, venue)
    - Name of the course
    - Date and duration of course
    - List of facilitators and their profession(s)
    - List of attendees (including designation and organisation)

12. A list of the exposure visits facilitated by your organisation
    - Related expenditures (travel, subsistence, facilitator fees, food)
    - Location of the visit
    - Date of the visit
    - Duration of visit
    - List of participants

13. A list of the advocacy/networking meetings facilitated by your organisation
    - Related expenditures (travel, subsistence, facilitator fees, food, venue)
    - Name of the event
    - Date of the event
    - Duration of event
    - List of facilitators and their profession(s)

14. A list of the supervisory, monitoring and evaluation visits carried out OR facilitated by your organisation
    - Related expenditures (travel, subsistence, monitors fees, food)
    - Location of the visit
    - Date of the visit
    - Duration of visit
    - List of monitors, qualifications and organisation affiliation

15. A list of any consultants' visits that have been organised by your organisation related to the management of the TIs
    - Related expenditures (travel, subsistence, monitors fees, food)
    - Location and purpose of the visit
    - Date of the visit
    - Duration of visit
    - List of monitors, qualifications and organisation affiliation

16. Please list all the buildings that are used by the TNSACS for the management of TIs:
    - Please include headquarters, any storage facilities, field offices, project offices etc)
    - What is the rental charge for each of these buildings? Is this the normal market rent for such a property?

17. Please list all the furnishings used for management of TI's in these buildings:
    - Please include headquarters, any storage facilities, field offices, project offices etc)
    - What was the cost of each of these items? When were they purchased and who funded them?

18. A list of all the capital items, equipment and furnishing used in the project, their purchase price and year of purchase
19. A list of all the vehicles used by the project (including provided NGO contribution and personnel owned), their purchase price and year of purchase.

20. The amount paid for:
    - building rent
    - utilities (water, electricity, gas)
    - communications (phone, fax, internet)
    - building maintenance (cleaning, fuel, etc)
    - vehicle maintenance (if applicable)
    - stationary and other office supplies/expenses (eg photocopying)

21. Travel expenses/travel claims/other claims (eg communication) incurred by the project and field staff and/or the vehicle log books if applicable

22. A list of the training that you and your staff have attended in the last financial year in relation to management of the TI interventions including:
    - Related expenditures (travel, subsistence, facilitator fees, food, venue)
    - Name of the course
    - Location of the course
    - Date of the course
    - Duration of course

TRU Records Review

Please can I look at the records or registers to see the following:

1. What is the budget for the management agency under the current contract? (Please provide the budget and its breakdown – in electronic format if possible – please specify the time period)
2. What is the annual expenditure for the most recent financial year? (Please provide the expenditure/financial statement with breakdown – in electronic format if possible – please specify the time period)
3. Please provide the monitoring reports (financial, activity and output reports) for the most recent financial year for all CSW, trucker and HHP interventions.
4. Please list all the buildings that are used by the TRU:
    - Please include headquarters, any storage facilities, field offices, project offices etc)
    - What is the rental charge for each of these buildings? Is this the normal market rent for such a property?
5. Please list all the furnishings in these buildings:
    - Please include headquarters, any storage facilities, field offices, project offices etc)
    - What was the cost of each of these items? When were they purchased and who funded them?
6. A list of the staff and volunteers working on the project in the last financial year (please include ALL staff – eg sweepers, drivers and other support staff) and their:
    - Name and designation
    - Qualification (if applicable)
    - Profession (for peer educators and volunteers)
    - Date started work with organisation
    - Date left organisation (if applicable)
    - Salary and benefits (including staff development) in most recent financial year
    - Allowances/ incentives in most recent financial year
7. A list of all the capital items, equipment and furnishing used in the project, their purchase price and year of purchase

8. A list of all the vehicles used by the project (including provided NGO contribution and personnel owned), their purchase price and year of purchase.
9. The amount paid for:
    - building rent
    - utilities (water, electricity, gas)
    - communications (phone, fax, internet)
    - building maintenance (cleaning, fuel, etc)
    - vehicle maintenance (if applicable)
    - stationary and other office supplies/expenses (eg photocopying)
10. Do you think the price of the above items reflects the true value? If not please can you explain why there is a difference and what the difference might be.
11. Travel expenses/travel claims/other claims (eg communication) incurred by the project and field staff and/or the vehicle log books if applicable
12. A list of the IEC materials distributed for use in education of the target group in the most recent financial year.

IEC material	Source	Year & cost of production	No. distributed

13. A list of the supplies used or distributed to the NGOs eg condoms, drugs, stationary etc in the last financial year.

Supply	Quantity used	Unit price	Purchase date

14. A list of the training that your staff have attended since the TRU inception including:
    - Related expenditures (travel, subsistence, facilitator fees, food, venue)
    - Name of the course
    - Location of the course
    - Date of the course

- Duration of course

15. A list of the training that has been provided or facilitated by your organisation for the NGOs
    - Related expenditures (travel, subsistence, facilitator fees, food, venue)
    - Name of the course
    - Date of the course
    - Duration of course
    - List of facilitators and their profession(s)
    - List of attendees
16. A list of the exposure visits facilitated by your organisation
    - Related expenditures (travel, subsistence, facilitator fees, food)
    - Location of the visit
    - Date of the visit
    - Duration of visit
    - List of participants
17. A list of the advocacy/networking events facilitated by your organisation
    - Related expenditures (travel, subsistence, facilitator fees, food, venue)
    - Name of the event
    - Date of the event
    - Duration of event
    - List of facilitators and their profession(s)
18. A list of the supervisory, monitoring and evaluation visits carried out OR facilitated by your organsiation
    - Related expenditures (travel, subsistence, monitors fees, food)
    - Location of the visit
    - Date of the visit
    - Duration of visit
    - List of monitors, qualifications and organisation affiliation
19. Please can I see a copy of the contract and any guidelines that you and the NGOs are required to follow in the contractual process.

Appendix 6: Peer educator interview guide

Interviews with peer educators

For the individuals listed in the volunteer and peer educators list we need to find out the value of this contribution to the project as well as an understanding of their relationship with the project..

We would like to interview all the peer educators. If there are more than 10 peer educators, aim to interview 20% of the peer educators. We will use this sample to estimate the values for the full group.
For CSW peer educators: you will need to sample based on the types of sex workers and/or income group.
For non CSW peer educators: select at least 1 peer educator from each profession– eg truckers helpers, loaders (hamalis), shop-owners, transport association representatives etc.

Provide each individual with an introduction to the project and ask the questions as follows.

We are carrying out a cost analysis of the targeted intervention. As you are a core partner to the intervention, I would like to ask a few questions about your work with the project. This will help me understand the value of your contribution to the project.

1. What is your:
    - age
    - sex
2. How many years of schooling have you completed? What is your education achievement?
3. When did you start work as a peer educator?
4. What was your motivation for starting work as a peer educator?
5. What are your responsibilities as a peer educator? What are the activities that you carry out?
6. Please can you describe to me the process of how you were recruited as a peer educator?
7. How many hours do you spend providing peer education activities each day/week?
8. How many days in a month do you work do you work as a peer educator?
9. What time of day do you normally carry out these activities?

10. What would you be doing at these times if you were not working in peer education? Eg. Is this….
    - Leisure time
    - When you would be carrying household chores
    - In working hours
    - Other – please describe
11. What other activities are you/ have you been involved in with the project (eg training, exposure visits, self help group development etc)
12. How much time in each week do you spend in these other activities related to the intervention (eg training, meeting with project staff, travel)
13. What would you be doing at these times if you were not working in peer education?
14. How many people did you contact and provide education/referrals to in the last month?
15. For each of these contacts how long did you spend on average with the individuals/ groups?
16. Do you receive any compensation from the project eg payment, travel allowances, gifts, social support. If so, please can you describe these (type, amount/value, frequency of payment etc)
17. Do you receive these payments in a timely manner? Are they sufficient to cover the services you provide?
18. What costs do you incur as a result of the project (eg transport, communications, incentives for peers to listen/seek treatment)? Please can you describe these.
19. What is your average expenditure on these project related items each month?
20. What benefits do you gain from being a peer educator?
21. Can you describe your relationship with the project? Have you or your peers had any difficulties in carrying out the project activities? What was the problem? How were these resolved?
22. Do all the peer educators receive the same level of compensation and benefits? If not, what are the different levels? And why do you think this is so?

If the peer educator is a sex worker please ask the following:

23. Do you get paid by a. the hour b. by the night, c. per encounter or d. other (please specify)
24. How much do you charge for each hour/ night/encounter or other?
25. How many paid encounters/working hours do you have in a working day on average?
26. How many days/nights do you work in a month?
27. Please can you tell me all the income-earning activities that you are involved in?
28. What is your average monthly earning from all sources?
29. What is your normal working pattern for these – i.e. number of days per month and number of hours per day; and the periods during the day and week that you are working on these.
30. You have worked hard and are now resting and having coffee with your friends. How much would I have to pay you to do some work for me for one hour?

Use framework overleaf to elicit value.

31. You are carrying out your household chores. How much would I have to pay you to do some work for me for one hour?

Use framework overleaf to elicit value.

32. You are at work. How much would I have to pay you to do some alternative work for me for one hour?

Use framework overleaf to elicit value.

Start by asking if they would give up their time for an amount of rupees equivalent to their daily income as identified earlier in survey. Go through the steps below until you converge on a minimum value.

If yes, then half the value

- If yes again, then half the amount again; if no, then ask q. with value midway between previous value and ½ the previous value
- If yes again, then half the amount again; if no, then ask q. with value midway between previous value and ½ the previous value

If no, then double the value

- If no again, then double the amount again; if yes, then ask q. with value midway between previous value and ½ the previous value
- If no again, then double the amount again; if yes, then ask q. with value midway between previous value and ½ the previous value

33. Do the benefits of working on the intervention outweigh the costs? Can you explain your reasons?

Thank the interviewee for their time.

Appendix 7: Assumed length of life of capital items

Capital inputs	*Life*
Training and start-up	Project life (5 years)
Medical equipment	Project life
Computers and other electrical equipments	5 years
Vehicle	10 years
Furniture and Typewriter	10 years

Appendix 8: Transaction cost survey interview guide

NGO:_____ For research purposes only

Targeted Interventions: Understanding the Contracts with Funding Agencies

Background to the contract

1. Please can you describe the contract(s) that you are working under for the TI:
    - Who is/are the funder(s)
    - What are the contract period(s)
    - What are you required to do by the funder/ contracting agency to implement the TI?
2. On what grounds was the contract awarded – competitive tender, direct negotiation or some other way? How was the award decision made?
3. If the contract has been renewed please can you describe the process of renewal. What was your reason for renewing the contract?
4. What was the reason/motivation for entering into this contract?
5. How was the price of the contract decided? Can you describe the process of negotiation with the purchaser for the setting of the budget? Is the money received adequate in terms of the services NGO provides, if not why? E.g. does not cover costs etc?
6. What is the required NGO contribution to the budget? What are the funding sources for this? Does the organisation/other sources contribute anything beyond its budgetary commitments, if so why and how much do you think this is?
7. Is there any flexibility in the budget? (e.g. do you have to stick to the budget categories or can you move money around) In theory and in practice?
8. What would be the implications or a. an overspend and b. an underspend in the budget? E.g. do you have to give the money back.
9. Are you paid on time with the amount that you are supposed to receive? If not please can you explain the reasons for any delays or differences? How often are there delays? Does this affect the way services are provided?
10. What is the funder/contracting agency required to do under the contract? Have they met with their obligations? If they didn't, would you be able to rectify this. How would you do this?
11. Which staff carry out activities related to the management of the contract and the contracting process? Do you see any of these staff as key in terms of your relations with the purchaser?

12. Who at your organisation was key to the development of the contract (i.e. identifying funder, proposal development, negotiation etc) ? What role (if any) did the executive committee/board of trustees play? How much time was spent by each of these individuals in the development of the project proposal and negotiating the contract agreement.

PERSON	Role/Activities	Time (days)
_____	_____	_____
_____	_____	_____
_____	_____	_____

13. Was investment in capital items such as equipment, computers, buildings etc required? If so, who funded these and which of these (and how many) are required for monitoring of the contract (eg computers)?
14. Did staff attend training during the implementation? Is this sufficient? Why
15. Do you think you would increase the investment in capital items and training or any other areas if the contracts were longer term? Why?
16. Does the purchaser set any criteria for the acquisition of supplies (eg condoms, drugs, IEC materials etc) or capital items or any other inputs? What are they?

Monitoring and Management of the Contract

17. Are you required to audit your accounts? If so, how frequently? How often does this happen in practice? Who pays for this and what is the cost?
18. Have you been provided with any training or support to help with the reporting system? Was this training effective? Why?
19. What are the implications of monitoring reports for your activities – i.e. how much time do you and your staff spend in preparing reports; which staff are prevented from carrying out normal daily activities and for how long?
20. Please describe any other monitoring mechanisms. What were the implications of this/these visits for your organisation – i.e. did you and your staff spend time in preparation and in hosting the visit; which of your staff were prevented from carrying out normal daily activities and for how long?
21. Has the reporting system changed since you started with the contractual partner? In what ways? (e.g. timing, content) What were the implications of these changes?
22. What problems do you face, if any, with this monitoring system?

23. If you wanted to, do you think it would be easy to provide false figures? If so how? (i.e. where are the weaknesses in the monitoring system)
24. Does the contract specify the penalties imposed in the case of a breach of contract?
    - How would you expect breaches of contract to be resolved in practice?
    - Do you/ would you refer to and use the contract document (e.g. stated obligations and sanctions) to resolve disputes?
    - Would you expect problems such as these to be resolved in a friendly way or would this be difficult and associated with mistrust?
    - Please can you describe your experience of this, if any. Were there any costs involved – what were these costs?
    - Do you know of other organisations where this has occurred, what happened?

Performance of contract

25. What are the advantages and disadvantages of working under this contract? Does the contract have an affect on service provision? Eg does it effect efficiency or quality?
26. Is this your only experience of working under a contract like this? Yes No
    - If not, please describe your experiences and how they are different to working on the targeted implementation (eg what other contracts have you worked on/ for what reasons/ with what funding agencies/ how was relationship with funder)?
    - If so, what adjustments have you had to make to do so (training, capacity development, investments etc)?
    - Which of these did you feel was the best system? What are your reasons for this?
27. Do you think working on this intervention improved the capacity of your organisation? In what way?
28. Do you think you are able to manage the contract and report effectively with the current mix of skills and experience? If not what further skills do you think you require?
29. Please can I see a copy of the contract for the targeted intervention (i.e. the contract you hold with the funding agency).

Scaling up

30. Has the size of the target group you cover changed over time? If so, please can you describe how has this changed.
    - What is the change in coverage? (population size, number of areas …etc)
    - Did this lead to changes in inputs (staff, travel etc) and activities – please can you describe the changes in detail?
    - Was this reflected in the contract? In what way?
    - Has increasing coverage affected the quality of services? How?
31. Do you think the current coverage is sufficient for prevention of HIV in this area? If not what and where are the gaps?
32. What action would be required to increase coverage of the CSWs from the current coverage level? What would be required in terms of further inputs (buildings, staff, equipment, supplies etc) if your organisation were to increase coverage in this way?

Appendix 9: Ethical approval

LONDON SCHOOL OF HYGIENE & TROPICAL MEDICINE
Keppel Street, London WC1E 7HT

Application Number .....
(To be added by the Secretary)

FORM A

ETHICS COMMITTEE
APPLICATION TO CONDUCT A STUDY INVOLVING HUMAN SUBJECTS

This form should be completed, signed by the Principal Investigator and Head of Department, and returned to Phoebe Roome, Personal Assistant to the Dean, LSHTM, Keppel Street, London WC1E 7HT.

Name of Principal Investigator: **Lorna Guinness**
Appointment held **Research Fellow** Date **July 16, 2001**

Other Personnel involved **Dr Lilani Kumaranayake (Supervisor)**
Professor Charles Normand (Sponsor)

Title of project **Economic Analysis of the Resource Requirements for Scaling Up HIV/AIDS Interventions at the State Level in India**

I approve this project scientifically.

.....
(Signature of Head of Department)

Date .....

Received by Secretary to the
Ethics Committee

.....

.....

1. Give an outline of the proposed project. Sufficient detail of the protocol must be given to allow the Committee to make an informed decision. (Attach a summary of the project if this is more convenient).

Using econometric methods, this research will investigate the key influences on the costs of scaling up HIV prevention interventions in two high prevalence States in India and identify the key policy implications of ensuring efficiency and adequate funding of this scaled up response to HIV. The multi-site study will collect cost data from a stratified sample of HIV prevention interventions using standard costing techniques including document analysis and interviews with project staff. To identify the factors affecting the costs of scaling up, the degree to which they do so, and the nature of organisational structures, qualitative data will be collected in semi-structured interviews with project staff. Using the quantitative and qualitative data, an econometric model will be developed to establish how costs change with coverage. Total resource requirements for 2 states (Tamil Nadu and Maharashtra) will be estimated for different levels of coverage and compared with the results obtained from more traditional methods of estimating scaling up costs. Methodologies for estimating marginal costs of HIV prevention interventions in a data constrained environment will be developed and resource requirements for a scaled up response in two States in India measured. Findings will be written up and reported to decision-makers in the two States and at the national level as well as to the organisations participating in the study.

2. State the intended value of the project. (If this project or a similar one has been done before what is the value of repeating it?).

To assist in the planning for the response to the HIV epidemic at the state level in India by measuring resource requirements for HIV prevention and predicting how these might change as activities are scaled up. By providing this in-depth understanding of the costs of interventions, the research will help to ensure value for money and adequate funding for HIV prevention in India. This type of empirical analysis and modelling of costs in India has not, to my knowledge, been undertaken before.

3. Specify the number, age, sex, source and method of recruiting subjects for the study. Attach a copy of any advertisement to be used.

Subjects for the study are organisations providing HIV prevention services. The sampling frame will be identified in year 1 of the study in a mapping analysis of organisations and projects working in HIV prevention in Tamil Nadu and Maharashtra. This will be compiled through a postal survey and interviews with experts. Information will be gathered on the type of activities being implemented and their coverage levels, for all projects identified in the mapping exercise. In the case of non-response, the postal survey will be followed up by personal contact. A sample of 30 projects from each state will be then be selected representative of the intervention types and coverage levels. This is an appropriate sample size for econometric estimation. Two randomly selected projects, from the sample, will be selected for pilot testing the data collection tools.

4. State the likely duration of the project, and where it will be undertaken.

This is a two part project.

- **Part 1: the mapping analysis and pilot testing of research instruments will take 1 year: October 2002 – October 2003.**
- **Part 2: the cost analysis (data collection, analysis and write up) will take 2 years: October 2003 – October 2005.**

5. Specify the procedures (including interviews) involving human subjects.

Part 1: Postal questionnaire to be completed by a project staff member obtaining information on HIV prevention activities, location of project, target group, length project has been running and approximate coverage.
Part 2: Semi-structured interviews with project staff and key stakeholders (for example: donors, community leaders, project clients) will be carried out by the research team. The content of the interviews will be developed in the first year of the project

6. State the potential hazards, if any, and the precautions being taken to meet them (include information on hazardous substances that will be used or produced, and the steps being taken to reduce risks).

This study poses no physical hazards to participants.

7. State the procedures or activities, which may cause discomfort or distress and the degree of discomfort or distress likely to be entailed by the subjects.

There is no risk of physical pain or discomfort to any of the subjects. Interview questions related to problems in project implementation could potentially cause minor distress to the interviewees, in particular if there is some form of corruption within the organisation. Care will be taken to be sensitive to these issues during the interviews and interviewees will be made fully aware that all information they provide will be treated as confidential.

8. Specify the degree of confidentiality to be maintained with respect to the data collected and the method of achieving this.

All study team members will be trained to respect strict conditions of confidentiality. Data will be securely stored. During the period of data collection, results will be recorded with personal identifiers and will be kept in a locked cupboard. Data and results will be aggregated so that they cannot be tied to individuals or organisations.

9. State the personal experience of the applicant and of senior collaborators in the study in the field concerned.

Lorna Guinness (applicant) has worked for 5 years as a health economist. In this time, she has worked at the Ministry of Health, Bangladesh, and UNAIDS, Geneva, and has been involved in data collection in several countries in South Asia and Africa. Lilani Kumaranayake (supervisor) has supervised cost studies in several countries in Africa, Asia and Eastern Europe and leads a group of researchers working on the costs of scaling-up for a variety of priority interventions at the global level. Professor Muraleedharan (overseas supervisor) has more than 15 years of research experience in the field of health care economics and policy analysis in India. In particular, he has worked on several studies on the private-public partnerships in health care provision in Tamil Nadu including a study on the role of government in HIV prevention. Dr Ramasundaram is the previous director of the Tamil Nadu State AIDS Society and is currently a consultant to WHO Commission on Macroeconomics and Health, advising on HIV/AIDS programmes.

10. State the manner in which consent will be obtained (eg verbal, written, witnessed) and supply copies of the information sheet and consent form. Healthy volunteers and patients will require different information sheets and consent forms. (See notes attached at end of this form).

Written consent will be obtained from each of the organisations selected for part 2 of the research. Please see attached (annexes A to C) for a sample letter requesting

consent, research protocol and a consent form. Verbal consent will be sought from all individual interviewees (see annex D).

11. State what medical supervision is available and its location in relation to the subjects.

Not applicable

12. Is the study initiated/sponsored by a pharmaceutical or other industrial company?

NO

If YES, name the company

13. (a) Does the project involve pre-marketing use of a drug/appliance or a new use for a marketed product?

NO

(b) If YES, does the company agree to abide by the guidelines on compensation of the Association of the British Pharmaceutical Industry (ABPI) (Clinical Trials -compensation for medicine-induced injury) in respect of patients?

YES / NO

If YES, a written statement from the company to this effect should be attached.

(c) In a study on healthy volunteers does the company agree to abide by the current guidelines of the ABPI for healthy volunteers?

YES / NO

If YES a copy of the proposed volunteer contract should be attached.

(d) What is the regulatory status of the drug under the Medicines Act 1968: Product Licence / Clinical Trial Certificate (CTC) / Clinical Trial Exemption (CTX) / Doctor or Dentist Exemption (DDX)? If CTC, CTX or DDX a copy of the certificate should be attached.

14. Will payments be made to subjects?

NO

If YES give details

15. Will the level of service or support available to study subjects be lower after the study than during the study?

NO

If yes, give details and describe the steps being taken to minimize the loss in welfare experienced by subjects at the termination of the study.

16. Describe the measures to be taken to communicate the results of the study to study subjects, their representatives, local government, national government and other relevant bodies who could use the results of the study to improve the lives of the study subjects.

Dissemination workshops in each state and consultations with key agencies involved in HIV prevention will inform policy makers on the intervention specific and organisational factors that affect the costs and on appropriate methods for estimating resource requirements.

To reach a wider audience, the study results will be submitted for publication to international peer reviewed journals and are likely to be presented a relevant health economics or AIDS conference(s).

17. Include any other relevant information.

18. Where the research is to take place overseas, the Principal Investigator **must** seek ethical approval, through his/her overseas collaborators, in the country(s) concerned. Approval will not be granted by the LSHTM Ethics Committee until this written approval is submitted.

Please list the countries where research is being undertaken

Other countries: **India**

Please submit formal ethical approval statement given by local committee within each country. If ethical approval has not yet been obtained from a local committee in the country, indicate to whom the proposal has been submitted and when a response is expected.

Ethical approval has been waived as it is not required for social sciences research. A letter from the Indian Institute of Technology Madras to this effect, is attached.

Signature of applicant

Medically qualified **NO**

Other qualifications (please state)

MA Economics and Economic History, University of Edinburgh 1991
MA Development Studies, School of Oriental and African Studies, 1993
MSc Health Policy Planning and Financing, London School of Hygiene and Tropical Medicine, 1996

Are you a member of a medical protection organisation? **NO**

Are you a member of any other protection organisation? **NO**

Annex A: Sample letter requesting consent from organisation

Date

Address Block

_____

_____

_____

Dear _____

The London School of Hygiene and Tropical Medicine and the Indian Institute of Technology (Madras) are undertaking a study to estimate the resource requirements of scaling up HIV prevention interventions at the state level in India. Your organisation has been identified as one of those that plays an important role in HIV prevention in this State. We would like to request the participation of your organisation in this study by providing organisation cost data and information regarding the structure of the organisation.

Attached is a copy of the protocol, which gives details of the data to be collected. The results of the study and the cost analyses specifically related to your organisation will be provided to you.

We hope that you will respond favorably to this request and will sign and return to us the accompanying consent form. Thank you.

Respectfully yours,

_____

Principal Investigator

Annex B: Research Protocol (to attach to letter seeking consent)

Title: Economic Analysis of the Resource Requirements for Scaling Up HIV/AIDS Interventions at the State Level in India

Background: To halt rising incidence of HIV in India, scaling up HIV prevention activities in order to achieve higher levels of coverage in target populations has been identified as a priority. Further, it has been shown that greater effectiveness and efficiency of HIV prevention can be achieved by targeting interventions to high risk populations such as sex workers and injecting drug users. The National AIDS Control Organisation (NACO) of India prioritises these targeted interventions but, although, programme coverage, is undocumented it is reported to be low and scaling up the response is now underway.

To ensure adequate funding, planning for the efficient scaling up requires an estimate of the resources required to do so. Information needed to make these estimates include the costs of implementation and how these costs change as activities are replicated or expanded. This study therefore aims to assist in the planning for the response to the HIV epidemic at the state level in India by:

- calculating costs of targeted HIV prevention interventions in India
- analysing how these change as activities are scaled up
- using this information to estimate resource requirements for HIV prevention

Methodology:

Data will be collected from a sample of organisations working on HIV prevention in Maharashtra and Tamil Nadu.

Calculation of costs: cost data will be collected from each organisation in the sample. Standard costing techniques will be used. Data sources will include project reports and documentation interviews with project staff, expenditure records, staff salary sheets, stock records and vehicle log books. To calculate unit costs indicators of coverage will be required and collected from project reports, documentation and interviews with project staff.

Factors affecting the costs of scaling up: Interviews will be carried out with organisation staff and organisation partners involved in the service delivery to provide an understanding of what factors may affect costs as activities are expanded and what barriers to expansion may exist.

All data will be treated as confidential and be stored in a secure place during the data collection and analysis. Data and results from each organisation will be aggregated in the final analysis so that they cannot be tied to specific individuals or organisations.

Implications of the findings: The cost analysis of each participating organisation will provide an understanding of the efficiency of their work, identify areas where cost savings can be made and assist in ensuring financial sustainability of the programme through a better understanding of resource requirements. The findings of the overall research will contribute to developing methodologies in the under-explored area of the costs of scaling up HIV prevention programmes and inform local and national policy-makers and planners.

Dissemination of the findings: Study findings will be disseminated to the participating organisations, policy-makers at the state and national level. They will also be submitted for publication in peer-reviewed journals and at international conferences.

Annex C: Sample Consent Form

Consent to Participation in the Study:
Economic Analysis of the Resource Requirements for Scaling Up HIV/AIDS Interventions at the State Level in India

Principle Investigator:
Lorna Guinness, Research Fellow,
London School of Hygiene and Tropical Medicine.

I have read the research protocol for the study and I understand what will be required of our organisation if we take part in the study.

I understand that the cost analysis at this organisation forms part of a broader study and that the presentation of the overall study results will be in the form of aggregated data so that it is not possible to link these data to specific organisations. However, the results of the cost analysis of our own organisation's activities will be made available to us on request and will remain confidential unless written permission is obtained from us. Further, I understand that all information provided in individual interviews with the research team will remain anonymous and confidential and will not be released, including to any other member of the organisation, without the permission of the interviewee.

My questions concerning this study have been answered by the research team led by Ms Guinness. I understand that at any time *the organisation* may withdraw from this study without giving a reason.

_____ *Organisation Name* _____ agrees to participate in this study.

Signed ..... Date .....

Name _____
Title _____

On behalf of the *Organisation Name*.

Annex D: Individual Consent Form

Hello, may name is _____ . I work for _____ . We are conducting a study at *your organisation* to learn more about the costs of HIV prevention and how this might change as activities are increased in *this state* . We are interviewing all key staff members in this organisation to help us collect cost data and understand how your organisation works.

I am enquiring today whether you would like to be interviewed about how the organisation works.

I want to assure you that all of your answers will be kept confidential. You have the right to stop the interview at any time or to skip any questions that you don't want to answer.

Your participation is completely voluntary but, by participating in the study, your experiences could be very helpful in ensuring effectiveness and value for money in the State response to HIV prevention.

NOTE WHETHER RESPONDENT AGREES TO INTERVIEW OR NOT

[ ] DOES NOT AGREE TO BE INTERVIEWED ⟶ THANK PARTICIPANT FOR THEIR TIME AND END

[ ] AGREES TO BE INTERVIEWED

Is now a good time to talk?
Is this a good place to hold the interview, or is there somewhere else you would like to go?

Appendix 10: Publication in Bulletin of the World Health Organization

Does scale matter? The costs of HIV-prevention interventions for commercial sex workers in India

Lorna Guinness,[1] Lilani Kumaranayake,[1] Bhuvaneswari Rajaraman,[2] Girija Sankaranarayanan,[3] Gangadhar Vannela,[4] P. Raghupathi,[5] & Alex George[4]

Objective To explore how the scale of a project affects both the total costs and average costs of HIV prevention in India.
Methods Economic cost data and measures of scale (coverage and service volume indicators for number of cases of sexually transmitted infections (STIs) referred, number of STIs treated, condoms distributed and contacts made with target groups) were collected from 17 interventions run by nongovernmental organizations aimed at commercial sex workers in southern India. Non-parametric methods and regression analyses were used to look at the relationship between total costs, unit costs and scale.
Findings Coverage varied from 250 to 2008 sex workers. Annual costs ranged from US$ 11 274 to US$ 52 793. The median cost per sex worker reached was US$ 19.21 (range = US$ 10.00–51.00). The scale variables explain more than 50% of the variation in unit costs for all of the unit cost measures except cost per contact. Total costs and unit costs have non-linear relationships to scale.
Conclusion Average costs vary with the scale of the project. Estimates of resource requirements based on a constant average cost could underestimate or overestimate total costs. The results highlight the importance of improving scale-specific cost information for planning.

Keywords HIV infections/prevention and control/economics; Prostitution; Sexually transmitted diseases/therapy; Contact tracing/economics; Condoms/economics; Costs and cost analysis; India (*source: MeSH, NLM*).

Mots clés Infection à VIH/prévention et contrôle/économie; Prostitution; Maladies sexuellement transmissibles/thérapeutique; Recherche sujet contact/économie; Condom/économie; Coût et analyse coût; Inde (*source: MeSH, INSERM*).

Palabras clave Infecciones por VIH/prevención y control/economía; Prostitución Enfermedades sexualmente transmisibles/terapia; Trazado de contacto/economía; Condones/economía; Costos y análisis de costo; India (*fuente: DeCS, BIREME*).

الكلمات المفتاحية: العدوى بفيروس العوز المناعي البشري، الوقاية من العدوى بفيروس العوز المناعي البشري ومكافحتها، معالجة العدوى بفيروس العوز المناعي البشري، اقتفاء المخالطين، اقتصاديات اقتفاء المخالطين، العوازل الذكرية، اقتصاديات العوازل الذكرية، التكاليف وتحليل التكاليف، الهند. (المصدر: رؤوس الموضوعات الطبية، المكتب الإقليمي لشرق المتوسط)

Bulletin of the World Health Organization 2005;83:747-755.

Voir page 754 le résumé en français. En la página 754 figura un resumen en español. يمكن الاطلاع على الملخص بالعربية في صفحة 754.

Introduction

UNAIDS has highlighted the urgent need to scale-up prevention programmes as global funding for treatment and care for people living with AIDS increases. The understanding of the resource requirements needed to expand these activities has improved at the global level as a result of costings made by UNAIDS and the Commission on Macroeconomics and Health (1–3). However, these estimates still lack standardized datasets on cost structures for particular interventions at different scales of activity and in different environments. Improving the understanding of resource requirements is critical to identifying the cost implications of efforts to expand ongoing prevention services included in the work of the Global Fund to Fight AIDS, Tuberculosis and Malaria; the World Bank's Multi-Country HIV/AIDS Program for Africa; and the World Health Organization's 3 by 5 initiative.

Economic theory hypothesizes that as scale increases, total costs increase at a changing rate, giving rise to the classic U-shaped average cost curve. This curve results from certain inputs varying with the level of output (such as the cost of condoms or drugs) and, in the short run, other costs remaining fixed (such as overheads and building costs). As the scale increases, fixed costs are shared over an increasing number of outputs until they reach the limit of their capacity. This sharing of fixed costs leads to non-linearities in the relationship between total costs and scale. Evidence from other health services supports the theory of non-linearities and suggests that costs vary with scale as well as with a number of other contextual, organizational and intervention-specific factors (4–12).

In India, where an estimated 5.1 million people are living with HIV or AIDS (13), the National AIDS Control Programme, under the direction of the National AIDS Control

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Ref. No. **04-017459**
(*Submitted: 13 August 2004 – Final revised version received: 10 December 2004 – Accepted: 10 January 2005*)

Organization, has contracted with nongovernmental organizations (NGOs) to target HIV prevention towards higher-risk groups (14–17, and National AIDS Control Organization, unpublished guidelines, 2000). Data on the costs of these initiatives are scarce (18, and D Wilson. Review of the Healthy Highways Project, unpublished report, 1999; V Gonzales et al. Midterm evaluation of West Bengal Sexual Health Project, unpublished report, 1999); there is little information to draw on from elsewhere (4, 19, 20); and there is limited evidence on how total costs change as activities expand (21).

In analysing the costs of 17 HIV-prevention interventions targeted at commercial sex workers in southern India, this paper explores how scale affects site-specific total costs and average costs of HIV prevention. It is the first paper to present cost data collected from multiple sites for a single HIV-prevention intervention. The analysis addresses previous problems of methodological and definitional differences and variations in input valuation, which researchers often face when using cost information from different studies (4, 20, 22), by using a standardized method across the sites. It is therefore able to explore how costs vary with scale.

Methods

Sample selection

A case-study approach was used to enable in-depth insights as well as collection of full economic costs. Seventeen NGOs were selected from the 259 targeted interventions identified in a census survey of interventions in Andhra Pradesh and Tamil Nadu (Table 1, available only on the web at http://www.who.int/bulletin). Both states had contracted with NGOs on a large scale (i.e., for more than 50 interventions). Interventions were purposively sampled according to their capacity, the funding agency, their geographical location, experience in implementing HIV interventions and willingness to participate. Only interventions aimed at commercial sex workers were selected in order to control for differences in intervention activities, epidemiology and target populations. Similarities in intervention design were further ensured by the National AIDS Control Organization's prescription of key components: information and education on behavioural change, condom distribution, peer education, management of sexually transmitted infections (STIs), and creating an enabling environment for the intervention (23, 24, and National AIDS Control Organization, unpublished guidelines, 2000).

Data collection

Economic data on providers' costs were collected for the financial year 2001–2002; data included information on costs incurred at the intervention-level and funding-agency level. Economic costs include all inputs involved in the intervention and value them at their opportunity cost (including inputs that are donated or subsidized). This provides a standardized method for data collection, enabling valid cost comparisons across the interventions. The ingredients approach to costing was used as far as possible (see, for example, (5)).

Measuring scale

Scale is defined from an economic perspective – that is, it is the extent or level of activity at which an intervention is operating (25, 26). *Coverage*, which is measured by the number of people reached, reflects scale as defined by national policy. Another six indicators reflect different aspects of the *volume* of services delivered: number of commercial sex workers referred for STI treatment, number of STIs treated, number of condoms distributed, number of first contacts made with members of the target group, total number of contacts made with members of the target group and total number of contacts with the members of the community. All scale measures were obtained from NGO's routine monitoring systems.

Input identification

Inputs were identified by reviewing project documentation, by interviewing project personnel and by ascertaining local market prices (Appendix 1, available only on the web at http://www.who.int/bulletin). They were classified as fixed or variable, according to standard economic definitions (5). Where quantities were not available, expenditures were used to represent input levels. Because methods of STI management varied, this was considered an input category in itself. Funding agency-level inputs were allocated to the interventions using direct allocation methods (27).

Cost valuation

All costs were valued at local market prices. Peer educators' time and costs were ascertained through a simple bidding game that generated values which were then validated in interviews with outreach staff. Condoms distributed free of charge were valued at the price of the lowest cost alternative in the market – that is, a subsidized socially marketed condom. Because there were

Table 3. **Characteristics of 17 HIV-prevention interventions run by selected nongovernmental organizations (NGOs) and targeted at sex workers, Tamil Nadu and Andhra Pradesh, India. Values are numbers (%), unless otherwise indicated**

Characteristics of the interventions[a]	Distribution
Intervention design	
STI treatment	
Referral	15 (88)
NGO's own clinic	2 (12)
Context	
Tamil Nadu	8 (47)
Andhra Pradesh	9 (53)
Median % (range) literacy	73 (59–85)
Median (range) length of time project under way (years)	6 (3–13)
Capacity	
Certified to receive foreign funds	
No certificate	3 (17.6)
Certified	14 (82.4)
Median No. (range) of staff working on HIV (n = 16)	39.3 (4.9–95.3)
Median (range) annual expenditure (US$ '000) (n = 14)	51.6 (5.3–1 088.3)
Financing	
Funding agency	
A	9 (52.9)
B	2 (11.8)
C	2 (11.8)
D	4 (23.5)
Median (range) HIV project budget (US$ '000) (n = 15)	15.5 (4.8–27.2)

[a] n = 17 unless otherwise specified.

no data on revenues, the net cost of condom sales (i.e., the cost of condom procurement minus revenue from sales) was assumed to be 0. Annualized economic costs were calculated using a standard discount rate of 3% (see, for example, (27)). Capital items were assumed to have a life of between 3 and 10 years, depending on the item. All costs were converted to constant 2002–03 Indian rupees, using the GDP (Gross Domestic Product) deflator, and then converted to US dollars (US$ 1.00 = 42 rupees) (28).

Analysis

Scale, total costs, cost structures and unit costs (total costs divided by a scale variable) were compared across the interventions. Due to the small sample size, non-parametric methods were used to look at the relationship between scale and the two cost variables: total costs and unit costs. The cost variables were regressed on scale, comparing linear and quadratic equation forms.

Non-parametric methods were also used to look at whether scale, total costs and unit costs are affected by factors including the state where the intervention took place, the funding agency, the method of STI management, district literacy levels, length of time the project has been under way, the intervention's budget and the NGO's capacity. Two tests were used: the median test for categorical explanatory variables (reported as Pearson's χ^2) and Spearman's rank–order correlation coefficient (r_s) test for independence of samples for the continuous explanatory variables (see, for example, (29)). The null hypothesis for each test was that there was no relationship between scale variables or cost variables and the explanatory variable.

Sensitivity analysis

Due to the retrospective nature of the study, several constraints were faced in data collection: some data were missing; there were inaccuracies in the data; and sometimes prices had to be used in place of cost. One-way sensitivity analysis was used to account for these limitations by manually changing values in the costing spreadsheets (Table 2, available at http://www.who.int/bulletin) and generating ranges of total costs and unit costs for each intervention. The non-parametric tests and regressions were then run again to explore whether relationships still held when extreme values were used.

Findings

NGO characteristics

Characteristics of the selected NGOs are described in Table 3. Of the sample, 8 were in Tamil Nadu and 9 were in Andhra Pradesh. Four different funding agencies were represented in the sample. District literacy rates ranged from 60% to 85%. The NGOs' total annual expenditures ranged from US$ 5324 to US$ 1.1 million, with the proportion of staff working on HIV representing between 5% and 95% of all staff. Three NGOs were not certified to receive foreign funds. The length of time the intervention had been under way varied from 3 to 13 years. Two of the interventions provided STI services at their own clinics; 12 NGOs referred people for treatment but subsidized their treatment; and 3 made referrals only.

Total costs and cost profiles

Total costs and their breakdown are described in Table 4. The median total cost was US$ 19 958 (range = US$ 11 274–52 793).

Table 4. **Total costs and cost profiles of 17 HIV-prevention interventions run by selected nongovernmental organizations (NGOs) and targeted at sex workers, Tamil Nadu and Andhra Pradesh, India**[a]

Cost category	Costs (US$ '000)[b]					
	Median		Minimum		Maximum	
Fixed personnel	3.63	(15.7)[c]	1.08	(6.5)	8.27	(22.6)
Training	0.12	(0.6)	0		1.70	(3.2)
Monitoring	0.55	(1.9)	0.03	(0.2)	0.92	(3.6)
Building and office costs	2.57	(12.7)	0.46	(3.6)	5.29	(26.1)
Vehicles	0.07	(0.4)	0	(0)	2.37	(10.4)
Total fixed	6.80	(34.1)	1.71	(13.5)	16.10	(40.6)
Variable personnel	4.62	(19.7)	1.28	(10.4)	6.49	(28.9)
Peer educators	2.16	(9.9)	0.34	(1.2)	12.83	(34.9)
Information, education and communication materials	0.38	(1.3)	0.01	(0.1)	2.21	(12.8)
STI treatment[d]	0.71	(3.3)	0	(0)	2.33	(10.7)
Condoms	0.85	(3.8)	0.01	(0.1)	7.37	(18.8)
Meetings	0.72	(3.5)	0.08	(0.4)	2.32	(8.8)
Transport	1.36	(4.6)	0.15	(1.2)	2.45	(9.3)
Other	0.40	(1.3)	0	(0)	1.62	(5.3)
Total variable	10.88	(53.2)	4.48	(39.7)	34.19	(70.7)
Total NGO	17.04	(88.5)	6.78	(60.1)	50.28	(95.3)
Agency	2.51	(11.5)	1.53	(4.7)	4.50	(39.9)
Total	19.96	(100.0)	11.27	(100.0)	52.79	(100.0)

[a] The minimum number of commercial sex workers reached by an intervention was 250; the median was 1047; the maximum was 2008.
[b] Costs are in 2002–03 prices.
[c] Values in parentheses are the median, minimum and maximum values for the percentages of total costs in each cost category.
[d] STI = sexually transmitted infection.

Table 5. **Coverage, volume per commercial sex worker reached and non-parametric tests for factors influencing scale variables for the 17 HIV-prevention interventions run by selected nongovernmental organizations (NGOs) and targeted at commercial sex workers, Tamil Nadu and Andhra Pradesh, India**

Intervention characteristic	Unit[a]	Sample size	Relationship with coverage (Spearman's r_s)[b]
Sex workers reached by the intervention (n = 17)	1 047 (250–2008)	17	1.000
People referred to health-care providers by the project for consultation on STI[c] (n = 17)	0.37[d] (0.09–2.20)	17	0.3235
People treated for STIs by the project or as a result of the project's referrals or subsidies (n = 15)	0.32[d] (0.11–0.71)	14	0.6205[e]
Condoms distributed for free and through NGO sales (n = 17)	101.10[d] (11.41–1001)	17	0.2304
First-time project contacts with members of the target group (n = 14)	0.71[d] (0.20–1.49)	15	0.4500[f]
Contacts with members of the target group (first and repeat) (n = 11)	3.43[d] (1.68–9.22)	11	0.2091
Contacts with members of the target group plus contacts with the broader community (first and repeat) (n = 11)	3.83[d] (2.30–10.19)	11	0.3455
Budget		17	0.7527[e]
Project age		17	0.2034
NGO expenditure		14	0.0549
HIV staff share		16	0.1321
Literacy		17	-0.5817[e]
			Pearson's χ^2
State		17	1.8862
Funding agency		17	4.9554[e]
Certified to receive foreign funds		17	0.1365
STI service provision		17	0.0048

[a] Values in this column are median (range).
[b] Values in this column measure the strength of the relationship between the variables: the closer r_s is to + /-1.0, the stronger the relationship between the two continuous variables; the higher the absolute value of χ^2, the stronger the correlation between the continuous and the categorical variables.
[c] STI = sexually transmitted infection.
[d] Value is per person reached.
[e] $P < 0.05$.
[f] $P < 0.01$

The levels at which costs are incurred and the cost profiles also vary. The median value of the proportion of costs incurred at the agency level (11.5%) hides a wide variation across NGOs, from 5% to 39.9%.

Variable costs range from 40% to 71% of total costs, with a median value of 53.2%. Personnel (staff time) costs are the largest portion of variable costs and range from 10% to 29%. On average the cost of peer education is the next largest part of variable costs (9.9%). The cost of peer educators also has the largest variation in relative contribution to the intervention. Although peer educators could be a substitute for or a complement to staff, no relationship, on average, is observed between the cost of peer educators and staff costs (r_s = 0.1368; probability t < 1 = 0.6764).

The cost of STI treatment appears to vary with the different methods of management; the proportion of costs attributable to STI treatment was highest at the two sites that provided clinic services. This relationship is not significant (Pearson's χ^2 = 1.6410; probability t < 1 = 0.2) indicating that other factors influence this part of the cost ratio, e.g. the share of peer-educator costs is low where the share of STI treatment costs is high. There is a wide variation in the relative costs of condoms, from 0.1% to 19% of total costs.

Profiles of fixed costs also show variability, ranging from 13.5% to 41% of total costs. Personnel and building costs (including rent and maintenance and all expenses associated with running an office) are the most important fixed costs, with median values of 16% and 12%, respectively. Although training costs appear to be low, the majority of these costs are incurred at the agency level, comprising between 6% and 28% of agency costs.

Scale of the interventions

In terms of coverage, interventions reached from 250 to 2008 commercial sex workers (Table 5), and non-parametric tests show that there are significant relationships between coverage and funding agency, budget (positive) and literacy rate (negative). Because coverage levels vary across the interventions, comparisons of service volume were made by first dividing the volume descriptors by coverage, thus revealing large variations in service volume. Although a relationship between volume and coverage was expected, no significant relationship was observed, except in the case of number of STIs treated.

Average costs of the interventions

Unit costs of the intervention are described in Table 6. The cost per person reached ranges from US$ 9.86 to US$ 50.70. The median value is US$ 19.20. Variation is also evident in the cost per unit of volume of services, e.g. the median cost per STI treated is US$ 62.50 (range = US$ 13.90–141.20) and the cost per first contact with the target group is US$ 26.30 (range = US$ 13.88–59.80).

Table 6. **Relationship between total costs, unit costs and scale for 17 HIV-prevention interventions run by selected nongovernmental organizations (NGOs) and targeted at commercial sex workers, Tamil Nadu and Andhra Pradesh, India**

Measure of scale	Total costs[a]	Unit costs (US$ '000)[b]	
		Median (range)	Spearman's rho (r_s)
Coverage (n = 17)	0.7990[c]	19.21 (9.86–50.70)	-0.5221[c]
Sexually transmitted infections referred (n = 17)	0.4828[c]	49.82 (16.47–167.48)	-0.8750[c]
Sexually transmitted infections treated (n = 14)	0.5017[d]	62.49 (13.91–141.19)	-0.7987[c]
Condoms distributed (n = 17)	0.4804[d]	0.22 (0.05–1.28)	-0.9216[c]
First contacts with target group (n = 15)	0.4500[d]	26.29 (13.88–59.81)	-0.7964[c]
All contacts with target group (n = 11)	0.4273	4.97 (1.74–11.27)	-0.7182[c]
All contacts (n = 11)	0.5545[d]	4.68 (1.57–8.46)	-0.5000
Median total cost (range) in US$ '000s	19.96 (11.27–52.79)		

[a] Values in this column measure the strength of the relationship between unit cost and the respective unit of scale: the closer r_s is to + /-1.0, the stronger the relationship between the two continuous variables.
[b] Values are constant 2002–03 prices.
[c] $P < 0.05$.
[d] $P < 0.01$

Analysis of cost variation

Total cost had statistically significant and positive relationships with both coverage and all but one of the indicators of volume (all contacts with the target group) (Table 6). Fig. 1 shows how total costs increase with coverage and suggests that total costs do not increase linearly. The quadratic model has a higher R^2 (measure of "goodness of fit" of the regression) than the linear form, supporting the hypothesis. The quadratic relationship between total costs and scale also applies to the volume indicators except condoms distributed, all contacts with target groups and all contacts. The regressions imply that there is a positive linear relationship between condoms and total costs. However, neither the linear model nor the quadratic model is a good fit for the relationships between the contact variables (F is not significant and $R^2 < 0.1$).

The null hypothesis (that there is no relationship between unit cost and measures of scale) can also be rejected. The results of the non-parametric tests of cost per unit of scale against the respective scale unit are all negative and, with the exception of all contacts, statistically significant (Table 6). The scale variables explain more than 70% of the variation in unit costs for all measures of unit costs except cost per sex worker reached and cost per contact. The influence of the factors, described in Table 3, on unit costs was also tested using non-parametric methods (see Appendix 2 and Appendix 3, available only on the web at http://www.who.int/bulletin). We could not reject the null hypothesis of no relationship except for a negative relationship between budget and the cost per condom distributed, a positive relationship between the length of time the project had been under way and the cost per sex worker referred for STI treatment or the cost per STI treated, a positive relationship between the price of field workers and the cost per contact, and a positive relationship between the price of peer educators and the cost per STI referred.

The regressions of unit costs against scale suggested non-linear relationships except in the case of all contacts (Fig. 2). In looking at the fitted regression line of cost per sex worker reached against coverage, we observed a fitted line resembling

Fig. 1. **Regression: a) Linear and b) quadratic forms of total costs against scale of HIV-prevention interventions targeted at commercial sex workers (CSWs).** (Values are for 2002–03 prices; additional statistical information is available at the following URL: http://www.who.int/bulletin)

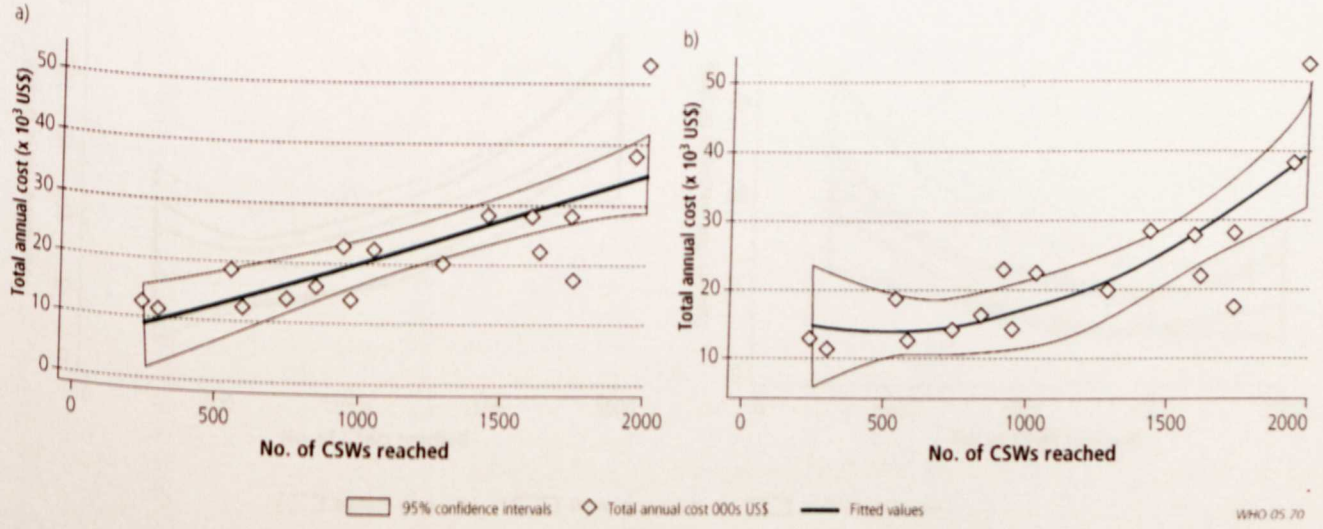
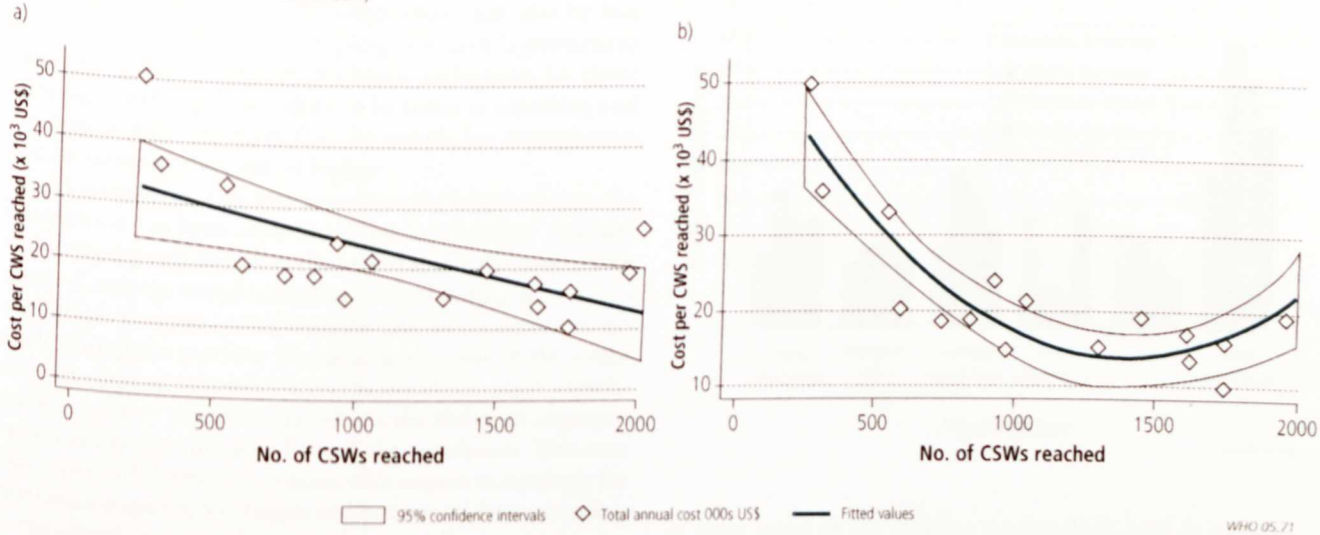


Fig. 2. **Fitted regression: a) Linear and b) quadratic forms of costs per unit of scale for the HIV-prevention interventions targeted at commercial sex workers (CSWs).** (Values are 2002–03 prices; additional statistical information is available at the following URL: http://www.who.int/bulletin)



a classic U-shaped average cost curve in which there is a cost-minimizing level of coverage in the range of 1000–1700 sex workers reached.

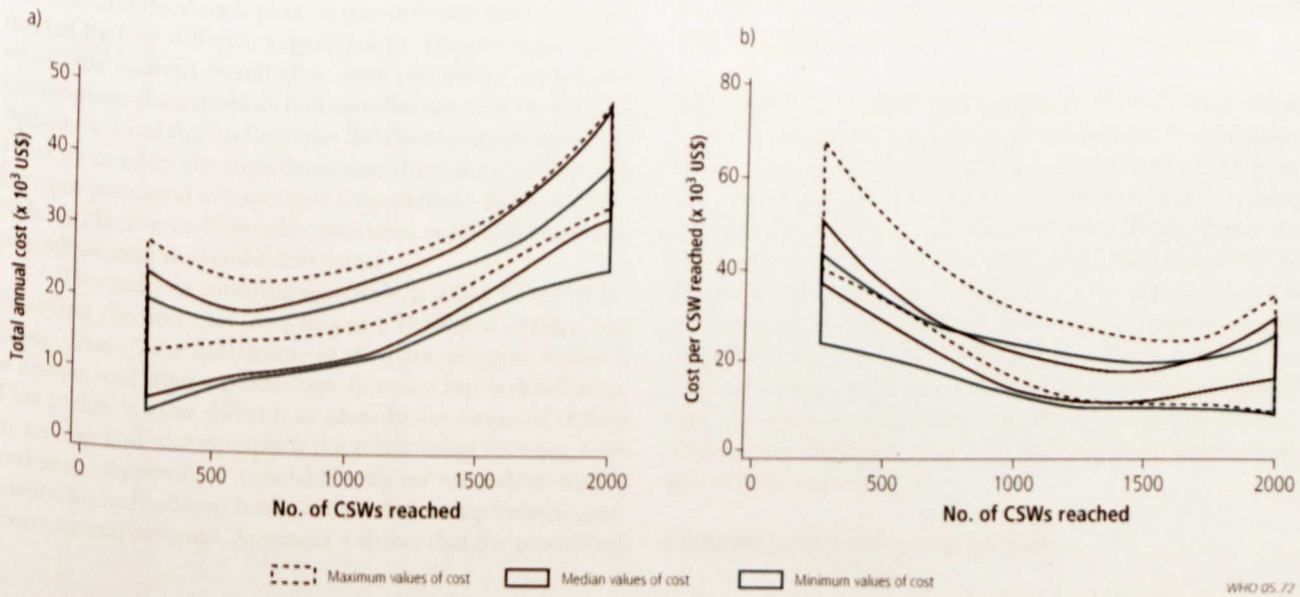
The sensitivity analysis generated ranges for the total costs between 10% and 40% of the value in the original analysis. Similarly, the range of unit costs was between 10% and 43% of the original values. The best-fit regression models for cost per person reached (Fig. 3) and cost per measure of volume held when they were run again with these extreme values.

Discussion

The cost analysis of targeted HIV-prevention interventions presented here explores how costs vary across similar interventions, with a particular focus on how costs vary according to the scale of the intervention. Differences were found in the scale, total costs, cost structures and average costs. Both total costs and average costs were found to have significant relationships with the scale variables. These relationships were not linear. Despite the large contribution of variable costs to the cost structure, average costs vary with scale: a point where average costs begin to rise is reached at relatively low levels of coverage.

This analysis is limited by being retrospective and by its use of routine monitoring systems not specifically designed for cost analyses. In some cases, inputs and values to the project were estimated based on interviews rather than records. Outputs were taken from routine monitoring systems, and these can be subject to errors. Financial data were used as a proxy for the economic costs of transport and monitoring owing to a lack of records. The small sample, compounded by the diversity in the organizations' characteristics, limits our ability to allow confident inference from the non-parametric and regression analyses. Therefore, interpretations of the results should be made with caution. In addition, it is not possible to determine

Fig. 3. **Sensitivity analysis plots of quadratic relationship between coverage of commercial sex workers (CSWs) and a) total costs and b) cost per person reached.** (Additional statistical information is available at the following URL: http://www.who.int/bulletin)



the strength of the relationships of scale with the other dimensions because multivariate analysis would be required. In spite of these problems, the one-way sensitivity analysis showed the results to be quite robust. Although there may also be bias resulting from the necessary sampling criteria of "agreement to participate", the direction of this bias is ambiguous, i.e. those agreeing to participate are likely to be better at reporting and this may or may not imply that the sample has average costs that are consistently lower or higher.

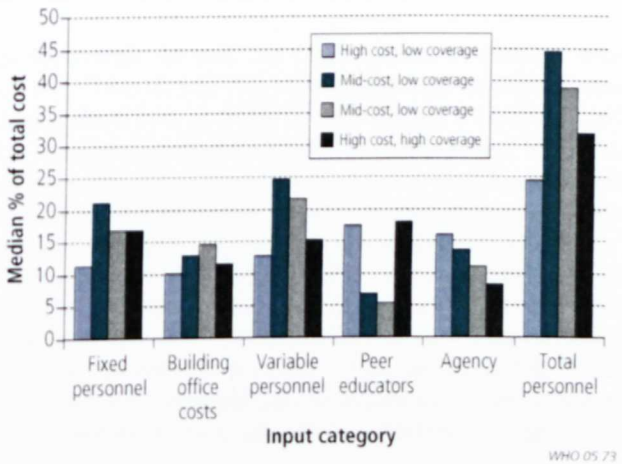
Variations in scale may arise from the length of time the intervention has been under way, the "reachability" and size of the target group as well as the targets set by the contracting agent. Coverage varied according to the funding agency and the budget. Because annual budgets depend on achievements made during the previous year and, at the time of the study, there was limited information on the size of the target populations, it is likely that coverage reflects the ability to negotiate targets rather than the actual size of the population. This may also apply to differences in volume with respect to coverage: for one funding agency, STI targets and budgets were set according to the agreed coverage of targets. However, these measures also confirm the degree of variation in technical efficiency (cost per unit of output) across apparently similar interventions.

As with scale, total costs are likely to be driven by budgets and targets set by the organizations. Further analysis finds that of the factors shown in Table 3, only "funding agency" had a significant relationship with total cost (Pearson's $\chi^2 = 13.4321$; probability $t < 1 = 0.004$). A wide range of factors has also been found to influence average costs including scale, intervention design, context, capacity, project age, inefficiencies and prices (5–8, 10–12, 19, 30–33). In order to facilitate the comparisons between costs and scale of operation, the sampling procedure controls for epidemiology, intervention design and context as far as possible. Inevitably, as the sample is taken from an active programme, these factors vary across the interventions. For example, two of the 17 interventions provided STI services within their own clinics. Other interventions referred people for treatment and, except for three interventions, provided a subsidy to the provider. Although this may limit the comparability of the interventions, it reflects the reality of scaling-up in which there will always be variation in the design of the intervention.

The context of the interventions also varied. The interventions examined took place in two different states and were funded by four different organizations. Despite these differences, the analysis found that these contextual factors and intervention characteristics had no influence on unit costs (see Appendix 2 and Appendix 3) nor did the non-parametric tests allow us to reject the hypothesis that there is no relationship between prices and average costs (Appendix 3). It was not possible to identify inefficiencies associated with different levels of performance in quantifiable form.

The analysis confirms that scale is a key factor in influencing the unit cost, resulting in a U-shaped average cost curve. Due to the limitations of the data, the cost function is not derived from a production function but is descriptive. This makes it more difficult to identify the causes of change in average cost and to explain the relationship between costs and scale. Appendix 4 (available only on the web at http://www.who.int/bulletin) looks at the relationship between cost structure and coverage. Appendix 4 shows that the percentage

Fig. 4. **Relationship between cost structure and coverage of the interventions**



of costs spent at the funding agency-level falls as coverage increases, but no other trends are discernable, emphasizing the context-specific nature of costs and the need for further research into the economics of the design and implementation of HIV prevention services.

The changing nature of the average cost has important implications for planning the resources needed for scaling-up interventions. Contrary to expectations that the high proportion of variable costs would lead to constant average costs and the resource estimation techniques that assume this, average costs fall and then rise again as coverage increases. Estimates of resource requirements that are based on a constant average cost would therefore significantly underestimate or overestimate the total costs. The results of this study, derived from a unique set of data on the costs of HIV prevention services across multiple sites, highlight the importance of using scale-specific cost information in order to identify the optimal size of an intervention and to improve estimates of resource requirements. ■

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Résumé

Coûts des interventions visant à prévenir la transmission du VIH chez les travailleurs du sexe indiens : influence de l'échelle du projet

Objectif Étudier l'impact de l'échelle d'un projet sur les coûts totaux et moyens de la prévention de la transmission du VIH en Inde.

Méthodes Pour 17 interventions gérées par des organisations non gouvernementales et visant les professionnels du sexe du sud de l'Inde, on a recueilli des données relatives aux coûts et des mesures de l'échelle du projet [couverture et indicateurs du volume de services correspondant aux nombres de cas d'infections sexuellement transmissibles (IST) adressés, d'IST traitées, de préservatifs distribués et de contacts noués avec les groupes cibles]. La relation entre coûts totaux, coûts unitaires et échelle du projet a été analysée par des méthodes non paramétriques et des analyses par régression.

Résultats La couverture des interventions allait de 250 à 2 008 professionnels du sexe. Les coûts annuels se situaient entre US $ 11 274 et US $ 52 793. Le coût médian par travailleur du sexe atteignait US $ 19,21 (plage de variation : US $ 10,00 à 51,00). Les variables d'échelle permettaient de justifier plus de 50 % de la variation des coûts unitaires pour l'ensemble des mesures de coût unitaire, excepté le coût par contact. Les coûts totaux et les coûts unitaires sont reliés à l'échelle par une relation non linéaire.

Conclusion Les coûts moyens varient avec l'échelle du projet. Les estimations des besoins en ressources se fondant sur un coût moyen constant pourraient donc conduire à une sous-estimation ou à une surestimation des coûts totaux. Les résultats de l'étude font ressortir l'importance pour la planification d'une meilleure information sur les coûts dépendant de l'échelle du projet.

Resumen

La escala, ¿un factor importante? Costo de las intervenciones de prevención de la infección por VIH entre los profesionales del sexo en la India

Objetivo Estudiar cómo influye la escala de un proyecto tanto en los costos totales como en los costos medios de la prevención de la infección por VIH en la India.

Métodos A partir de 17 intervenciones emprendidas por organizaciones no gubernamentales entre profesionales del sexo en el sur de la India, se reunieron datos sobre los costos económicos e indicadores de la escala de la intervención (cobertura y volumen de servicios para el número de casos de infecciones de transmisión sexual (ITS) remitidos, número de ITS tratadas, número de preservativos distribuidos y contactos habidos con los grupos destinatarios). La relación entre los costos totales, los costos unitarios y la escala se determinó mediante métodos no paramétricos y análisis de regresión.

Resultados La cobertura varió entre 250 y 2 008 profesionales del sexo. Los costos anuales oscilaron entre US$ 11 274 y US$ 52 793. La mediana del costo por profesional del sexo alcanzado fue de US$ 19,21 (intervalo: US$ 10,00 - 51,00). Las variables indicativas de la escala explican más del 50% de la variación de los costos unitarios para todas las medidas del costo unitario, exceptuando el costo por contacto. Los costos totales y los costos unitarios están relacionados de manera no lineal con la escala.

Conclusión Los costos medios varían con la escala del proyecto. Las estimaciones de las necesidades de recursos basadas en un costo medio constante tienden a subestimar o sobrestimar los costos totales. Los resultados destacan la importancia de mejorar la información sobre los costos en función de la escala a efectos de planificación.

ملخص

هل لسلالم القياس أهمية

تكاليف تداخلات وقاية المومسات من فيروس العوز المناعي البشري في الهند

الملخص: للتعرف على مدى تأثير سلالم القياس لمشروع ما على كل من التكاليف الكلية والتكاليف الوسطية للعدوى بفيروس العوز المناعي البشري في الهند.

الطرق: تم جمع معطيات حول التكاليف الاقتصادية ومقاييس سلالم القياس (مدى التغطية ومؤشرات مقادير الخدمات لعدد من حالات العدوى المنتقلة جنسياً التي تم تحويلها، وعدد حالات العدوى المنتقلة جنسياً التي تم معالجتها، وعدد من العوازل الذكرية التي تم توزيعها وعدد المخالطات) لدى المجموعات المستهدَفة من 17 من التداخلات التي قامت بها منظمات غير حكومية والتي استهدفت المومسات في جنوب الهند. وقد استخدم كل من الطرق غير المعلمية والتحليل التحوفي لدراسة العلاقة بين التكاليف الإجمالية وتكاليف الوحدة وسلم القياس.

الموجودات: تراوح مدى التغطية بين 250 و 2008 من المومسات، وتراوحت التكاليف السنوية من 11 274 دولاراً أمريكياً إلى 52 793 دولاراً أمريكياً وقد بلغت التكلفة الوسطية لكل مومس 19.21 دولاراً أمريكياً (بمدى يتراوح بين 10 و51 دولاراً أمريكياً). وتفسر المتغيرات في سلم القياس أكثر من نصف التفاوت في تكاليف الوحدة لجميع مقاييس تكاليف الوحدات باستثناء تكاليف المخالطة الواحدة. ولم يكن بين التكاليف الإجمالية وتكاليف الوحدات علاقة خطية مع سلم القياس.

الاستنتاج: تختلف التكاليف الوسطية باختلاف سلم القياس المتبع في المشروع، ويمكن أن تؤدي تقديرات المتطلبات المُستندة على التكاليف الوسطية الثابتة إلى الإقلال من أو الإفراط في تقدير التكاليف. إن النتائج توضح أهمية تحسين المعلومات اللازمة للتخطيط الخاص بتكاليف كل سلم قياس على حدة.

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Appendix 11: Funding/management agency cost profiles

State	Funding agency	NGO code	Building		Personnel		IEC materials		Transport		Monitoring		Training		Other		Total
			INR (000s)	%	INR (000s)	%	INR (000s)	%	INR (000s)	%	INR (000s)	%	INR (000s)	%	INR (000s)	%	
Tamil Nadu	CAPACS	14	22.9	17.2	73.7	55.4	10.6	7.9	0.8	0.6	9.2	6.9	-	-	3.2	2.4	133.1
		13	22.9	17.2	73.7	55.4	10.6	7.9	0.8	0.6	9.2	6.9	-	-	3.2	2.4	133.1
	Median		*22.9*	*17.2*	*73.7*	*55.4*	*10.6*	*7.9*	*0.8*	*0.6*	*9.2*	*6.9*	-	-	*3.2*	*2.4*	*133.1*
	CCOORR	1	44.5	21.2	91.1	43.3	-	-	1.0	0.5	2.2	1.0	-	-	50.4	23.9	210.5
		7	44.5	21.2	91.1	43.3	-	-	1.0	0.5	2.2	1.0	-	-	50.4	23.9	210.5
	Median		*44.5*	*21.2*	*91.1*	*43.3*	-	-	*1.0*	*0.5*	*2.2*	*1.0*	-	-	*50.4*	*23.9*	*210.5*
	TNSACS	8	6.0	9.2	11.3	17.3	-	-	3.2	4.9	5.0	7.7	18.3	28.1	20.4	31.3	65.3
		17	6.0	9.2	11.3	17.3	-	-	3.2	4.9	5.0	7.7	18.3	28.1	20.4	31.3	65.3
		16	6.0	9.2	11.3	17.3	-	-	3.2	4.9	5.0	7.7	18.3	28.1	20.4	31.3	65.3
		6	6.0	9.2	11.3	17.3	-	-	3.2	4.9	5.0	7.7	18.3	28.1	20.4	31.3	65.3
	Median		*6.0*	*9.2*	*11.3*	*17.3*	-	-	*3.2*	*4.9*	*5.0*	*7.7*	*18.3*	*28.1*	*20.4*	*31.3*	*65.3*
	Median		*14.5*	*13.2*	*42.5*	*30.3*	-	-	*2.1*	*2.7*	*5.0*	*7.3*	*9.2*	*14.0*	*20.4*	*27.6*	*99.2*
Andhra Pradesh	APSACS	10	8.8	6.5	37.7	27.9	38.0	28.1	4.2	3.1	3.6	2.7	8.2	6.1	22.1	16.3	135.5
		19	8.8	6.5	37.7	27.9	38.0	28.1	4.2	3.1	3.6	2.7	8.2	6.1	22.1	16.3	135.5
		11	8.8	6.5	37.7	27.9	38.0	28.1	4.2	3.1	3.6	2.7	8.2	6.1	22.1	16.3	135.5
		2	8.8	7.1	26.0	21.0	38.0	30.7	4.2	3.4	3.6	2.9	8.2	6.6	22.1	17.8	123.7
		18	8.8	7.7	26.0	22.7	16.4	14.4	4.2	3.7	3.6	3.2	24.4	21.3	22.1	19.3	114.3
		3	8.8	7.7	26.0	22.7	16.4	14.4	4.2	3.7	3.6	3.2	24.4	21.3	22.1	19.3	114.3
		4	8.8	7.7	26.0	22.7	16.4	14.4	4.2	3.7	3.6	3.2	24.4	21.3	22.1	19.3	114.3
		15	8.8	7.7	26.0	22.7	16.4	14.4	4.2	3.7	3.6	3.2	24.4	21.3	22.1	19.3	114.3
		9	8.8	7.7	26.0	22.7	16.4	14.4	4.2	3.7	3.6	3.2	24.4	21.3	22.1	19.3	114.3
		5	8.8	7.1	34.5	28.1	16.4	13.4	4.2	3.4	3.6	2.9	24.4	19.9	22.1	18.0	122.9
		12	8.8	10.4	4.6	5.5	6.2	7.3	4.2	5.0	3.6	4.3	23.3	27.5	22.1	26.1	84.5
	Median		*8.8*	*7.7*	*26.0*	*22.7*	*16.4*	*14.4*	*4.2*	*3.7*	*3.6*	*3.2*	*24.4*	*21.3*	*22.1*	*19.3*	*114.3*
Median			8.8	7.7	26.0	22.7	16.4	13.4	4.2	3.7	3.6	3.2	18.3	21.3	22.1	19.3	114.3
Minimum			6.0	6.5	4.6	5.5	-	-	0.8	0.5	2.2	1.0	-	-	3.2	2.4	65.3
Maximum			44.5	21.2	91.1	55.4	38.0	30.7	4.2	5.0	9.2	7.7	24.4	28.1	50.4	31.3	210.5

Appendix 12: Accounting for uncertainty in the analysis of total costs and cost profiles

Accounting for uncertainty in analysis on total costs and cost profiles, INR (2002/3 prices)

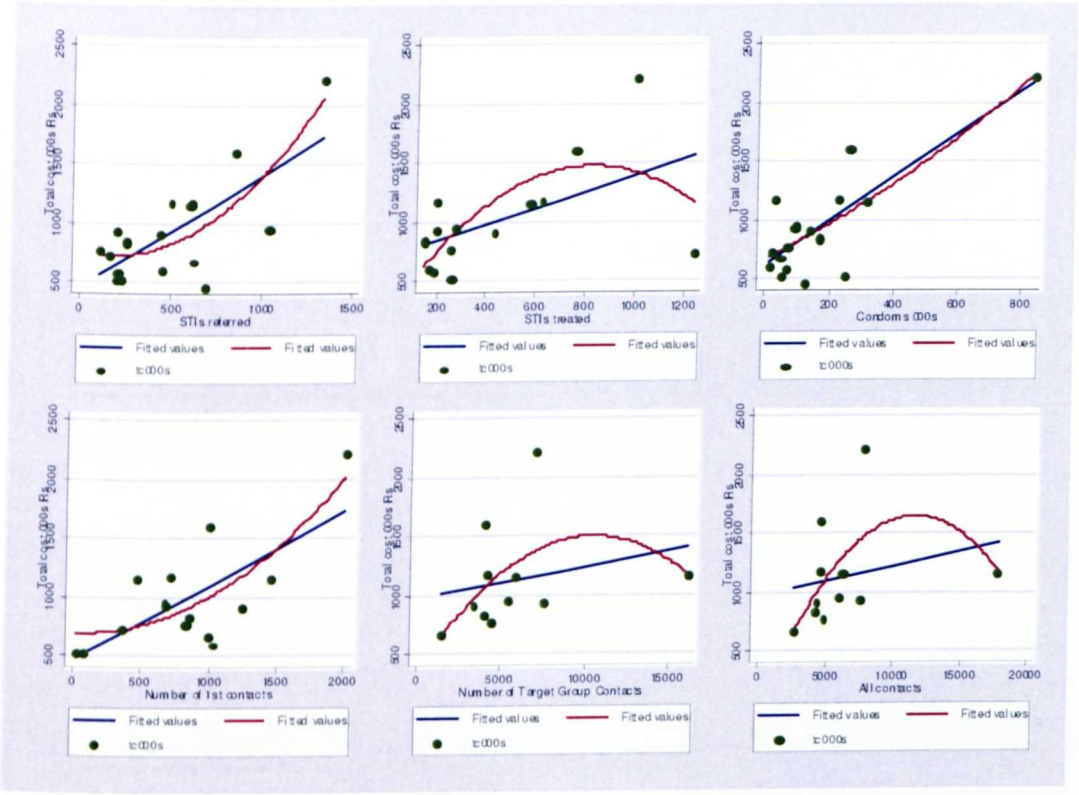
	Total cost					Variable/total cost ratio				
NGO code	Max	Value used	Min	Range	Range (% of used value)	Max	Value used	Min	Range	Range (% of used value)
13	822051	677579	595630	226421	0.33	0.54	0.4423	0.39	0.15	0.35
14	713061	474300	411378	301683	0.64	0.46	0.3971	0.21	0.25	0.63
1	728225	520620	474958	253268	0.49	0.60	0.5816	0.39	0.21	0.36
7	732555	533252	479496	253059	0.47	0.54	0.5106	0.34	0.20	0.39
6	924616	725012	506576	418040	0.58	0.73	0.7072	0.45	0.28	0.39
8	958990	775062	644945	314046	0.41	0.53	0.5162	0.33	0.19	0.38
16	812133	601064	522978	289155	0.48	0.53	0.4874	0.32	0.21	0.44
17	854236	593973	459541	394695	0.66	0.71	0.6609	0.41	0.29	0.45
2	1223320	1176322	1149250	74071	0.06	0.56	0.5488	0.52	0.03	0.06
3	1002346	920238	849381	152965	0.17	0.55	0.5337	0.47	0.08	0.15
4	1217006	1170102	1015903	201103	0.17	0.59	0.5268	0.50	0.09	0.17
5^	863227	835327	740964	122263	0.15	0.46	0.4120	0.39	0.08	0.19
9	2245230	2220988	1715405	529825	0.24	0.71	0.6476	0.59	0.12	0.19
10	1088364	958940	916696	171668	0.18	0.52	0.4774	0.43	0.09	0.18
11	932527	839664	754593	177933	0.21	0.57	0.5133	0.46	0.10	0.20
12^	1812691	1755091	1660932	151759	0.09	0.67	0.6705	0.63	0.04	0.06
15	1647184	1609341	1313238	333946	0.21	0.66	0.5811	0.54	0.11	0.19
18	1200962	1163476	1104583	96378	0.08	0.56	0.5496	0.52	0.04	0.08
19	967200	940291	823790	143410	0.15	0.57	0.5318	0.49	0.08	0.15
Median				226421	0.21				0.11	0.19
Minimum				74071	0.06				0.03	0.06
Maximum				529825	0.66				0.29	0.63

Accounting for uncertainty in analysis on unit costs, INR (2002/3 prices)

	Unit costs (one way)					Unit costs (two way)				
NGO code	Max	Value used	Min	Range	Range (% of used value)	Max	Value used	Min	Range	Range (% of used value)
13	967	797	701	266.38	0.33	1075	797	637	437.54	0.55
14	2293	1525	1323	970.04	0.64	2548	1525	1203	1345.05	0.88
1	1214	868	792	422.11	0.49	1349	868	720	628.93	0.72
7	2930	2133	1918	1012.24	0.47	3256	2133	1744	1512.18	0.71
6	529	415	290	239.02	0.58	587	415	263	324.09	0.78
8	1744	1409	1173	570.99	0.41	1937	1409	1066	871.33	0.62
16	840	622	541	299.02	0.48	933	622	492	441.50	0.71
17	1139	792	613	526.26	0.66	1266	792	557	708.52	0.89
2	841	808	790	50.91	0.06	934	808	718	216.13	0.27
3	613	563	520	93.61	0.17	682	563	473	209.03	0.37
4	696	669	581	115.05	0.17	774	669	528	245.24	0.37
5^	108	105	93	15.31	0.15	120	105	84	35.76	0.34
9	1118	1106	854	263.86	0.24	1242	1106	777	465.76	0.42
10	1164	1026	980	183.60	0.18	1293	1026	891	402.07	0.39
11	717	645	580	136.77	0.21	796	645	527	269.14	0.42
12^	126	122	115	10.55	0.09	140	122	105	35.04	0.29
15	839	819	669	170.03	0.21	932	819	608	324.01	0.40
18	745	721	685	59.75	0.08	827	721	623	204.73	0.28
19	924	898	787	136.97	0.15	1026	898	715	311.14	0.35
Median				184	0.21				324	0.42
Minimum				11	0.06				35	0.27
Maximum				1012	0.66				1512	0.89

Appendix 13: Scatter plots and fitted linear and quadratic regressions of costs against volume

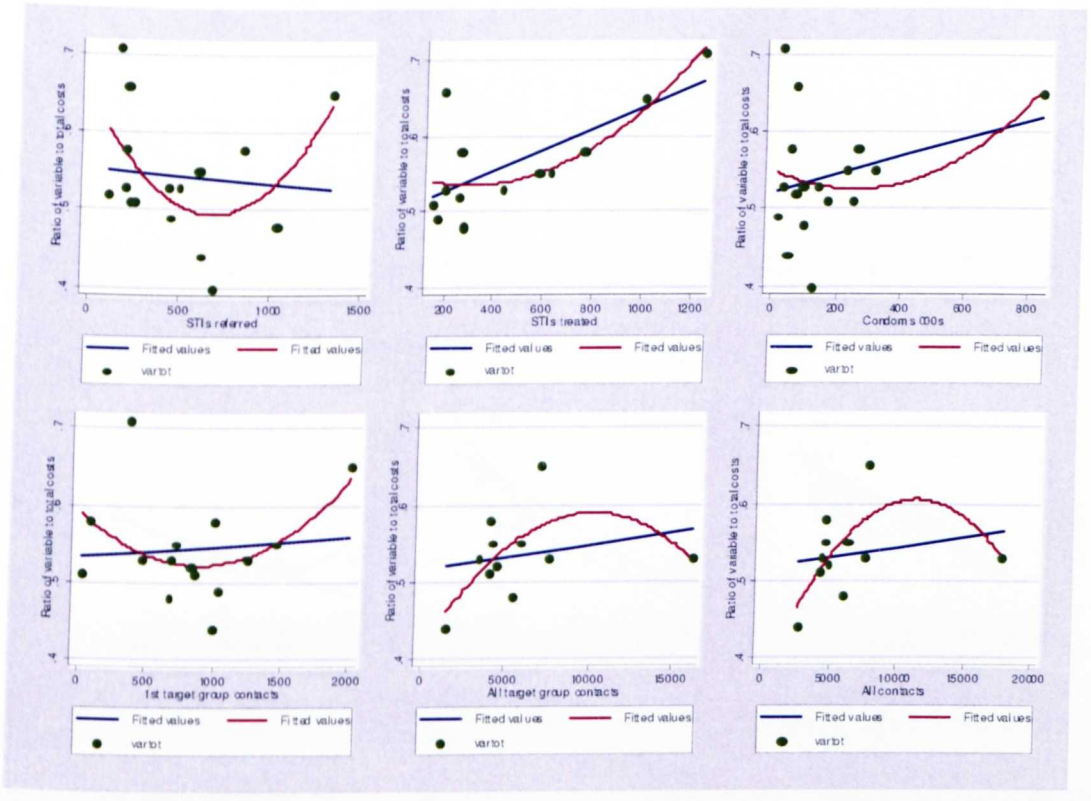
a) TOTAL COSTS AGAINST VOLUME VARIABLES.



tc000s = total cost 000s Rs; Only CSW interventions;

		Number of obs	F	Prob > F	Adj R-squared	Coefficient	Coefficient (sq)	Constant
STIs referred	linear	17	16.48	0.001	0.4917	949.4696*		462750.6*
	quadratic		10.87	0.0014	0.5523	-356.2357	0.9999254**	755843.9*
STIs treated	linear	14	4.74	0.0502	0.2234	698.8528*		700530.6*
	quadratic		4.69	0.0336	0.3622	3038.486*	-1.839354**	222627.9
Condoms distributed	linear	17	28.35	0.0001	0.6309	1841.953*		633209.8*
	quadratic		13.53	0.0005	0.6104	1351.542	0.6096121	675171.9*
Target group 1st contacts	linear	15	13.04	0.0032	0.4624	619.723*		480004.1*
	quadratic		8.21	0.0057	0.5074	-26.96081	0.3426658	695912.8*
Target group all contacts	linear	11	0.5	0.4972	-0.0526	26.42961		980611.5*
	quadratic		1.13	0.3702	0.025	217.0396	-0.0103611	367218.4
All contacts	linear	11	0.53	0.4863	-0.0496	25.37985		970238.4*
	quadratic		1.61	0.2583	0.1088	283.4398	-0.0121984	6640.153

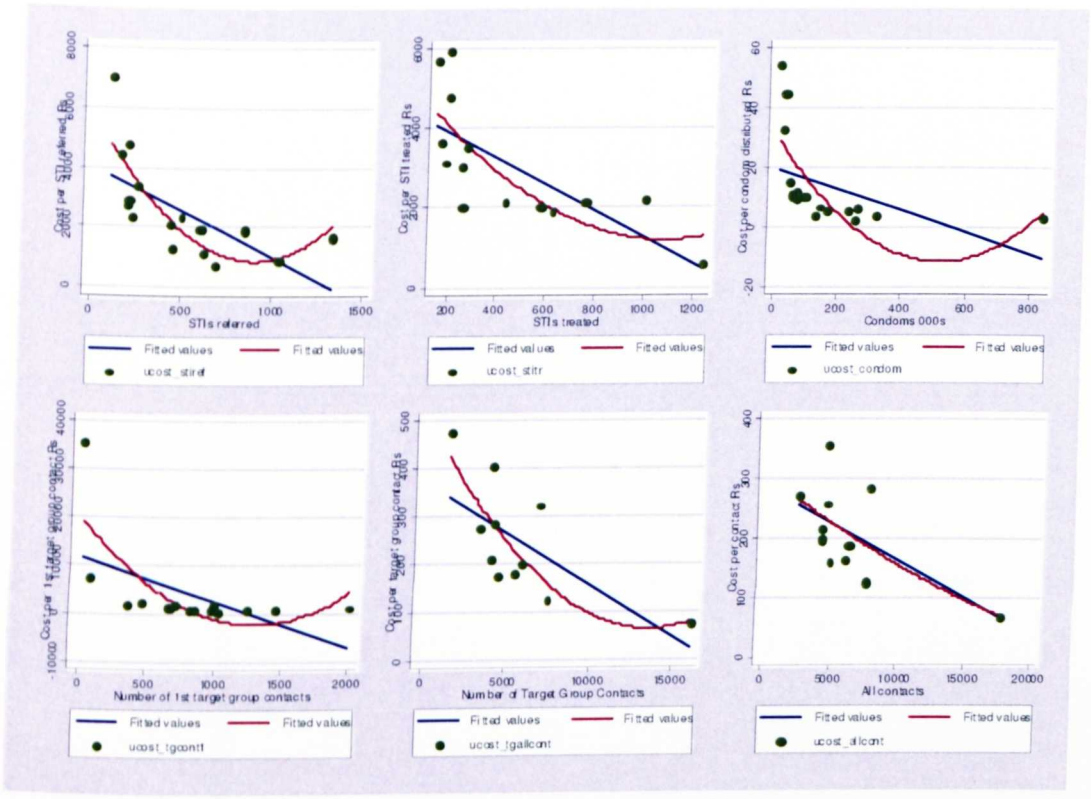
b) RATIO OF VARIABLE TO TOTAL COSTS AGAINST VOLUME VARIABLES



vartot = ratio of variable to total costs; Only CSW interventions;

		Number of obs	F(1, 15)	Prob > F	Adj R-squared	Coefficient	Coefficient (sq)	Constant
STIs referred	linear	17	0.12	0.7299	-0.0579	-0.0000207		0.5526429*
	quadratic		3.32	0.0663	0.2245	-0.0004578*	0.000000335*	0.6507761*
STIs treated	linear	14	11.93	0.0048	0.4566	0.0001388*		0.4996279*
	quadratic		8.16	0.0067	0.5242	-0.0001228	0.000000206	0.5530667*
Condoms distributed	linear	17	1.34	0.2649	0.0209	0.0001137		0.5237091*
	quadratic		1.22	0.325	0.0267	-0.0001932	0.000000381	0.549965*
Target group 1st contacts	linear	15	0.09	0.7645	-0.0692	0.000011		0.5349334*
	quadratic		1.93	0.1879	0.1171	-0.0001579	0.0000000895**	0.5913508*
Target group all contacts	linear	11	0.5	0.4962	-0.0523	0.00000321		0.5152423*
	quadratic		2.27	0.1653	0.2029	0.0000346**	-0.00000000171**	0.4140923*
All contacts	linear	11	0.43	0.5304	-0.0609	0.00000278		0.5159123*
	quadratic		2.62	0.1332	0.2449	0.0000413**	-0.00000000182**	0.3721782*

c) UNIT COSTS AGAINST RESPECTIVE VOLUME VARIABLES.



Ucost=unit cost; stiref = stis referred; stitr = stis treated; condom = condoms distributed; tgcont1 = 1st contacts with target group; tgallcont = all contacts with target group; allcont = all contacts with community; Only CSW interventions;

		Number of obs	F(1, 15)	Prob > F	Adj R-squared	Root MSE	Coefficient	Coefficient (sq)	Constant
STIs referred	linear	17	11.45	0.0041	0.3951	1255.1	-3.11905*		4115.191*
	quadratic		15.13	0.0003	0.6385	970.32	-11.2303*	0.0062117*	5935.933*
STIs treated	linear	14	13.88	0.0029	0.4976	1089.5	-3.266728*		4525.045*
	quadratic		8.13	0.0068	0.5231	1061.5	-7.89937**	0.0036421	5471.326*
Condoms distributed	linear	17	4.2	0.0582	0.1668	13.968	-0.0365041**		19.74878*
	quadratic		7.58	0.0059	0.4513	11.336	-0.1650868*	0.0001598*	30.75098*
Target group 1st contacts	linear	15	5.16	0.0408	0.229	7811.4	-9.249084*		11561.08*
	quadratic		7.78	0.0068	0.492	6340.7	-33.72288*	0.0129682*	19732.15*
Target group all contacts	linear	11	7.93	0.0202	0.4094	92.053	-0.0213823*		369.9944*
	quadratic		5.79	0.0279	0.4893	85.598	-0.0657256**	0.00000241	512.6934*
All contacts	linear	11	6.09	0.0357	0.3374	66.23	-0.0126332*		288.2905*
	quadratic		2.74	0.1243	0.2578	70.092	-0.0177031	0.00000024	307.2215*

Appendix 14: Sensitivity analysis of the costs of the case study HIV prevention projects

a). Total costs and volume

Volume indicator	*STIs referred*		*STIs treated*		*Condoms*		*1st contacts*		*All target group contacts*		*All contacts*	
Total costs	*max*	*min*	*max*	*min*	*max*	*min*	*max*	*min*	*max*	*min*	*max*	*min*
Number of obs	17	17	14	14	17	17	15	15	11	11	11	11
	Linear											
F(1, 15)	20.02	20.2	5.61	2.95	32.89	21.82	8.94	9.21	0.39	0.53	0.44	0.55
p	0.0004	0.0004	0.0355	0.1117	0	0.0003	0.0105	0.0096	0.5466	0.486	0.5239	0.4778
Adj R-squared	0.5432	0.5455	0.2618	0.1303	0.6659	0.5654	0.3618	0.3695	-0.0647	-0.0496	-0.0594	-0.0473
Volume	855.9238*	803.1307*	648.6388*	474.8877	1.628294*	1.416553*	493.9992*	453.363*	22.91846*	21.81467*	22.67837	20.82088
Constant	636943.3*	408414.9*	835443.6*	656653*	795886.3*	575810.1*	693307.7*	481075.9*	1055928*	843213.6*	1042661*	835463.3*
	Quadratic											
F(2, 14)	14.6	9.98	4.6	5.59	16.86	10.31	8.38	5.62	0.84	1.05	1.28	1.47
p	0.0004	0.002	0.0353	0.0212	0.0002	0.0018	0.0053	0.019	0.4651	0.3948	0.3297	0.2865
Adj R-squared	0.6295	0.529	0.3564	0.4137	0.6647	0.538	0.5133	0.3976	-0.0323	0.0091	0.0528	0.0855
Volume	-392.2899	374.9005	2447.322*	2981.203*	0.7978502	1.726042	-369.3119	-39.41916	188.0648	168.0462	253.6262	219.0233
Volume sqd	0.9558977**	0.327944	-1.414074	-1.970395*	1.032295	-0.3847151	0.4574526*	0.2611162	-0.008977	-0.0079488	-0.0109169	-0.009369
Constant	917131.4*	504540.2*	468037.6**	144703.1	866943.4*	549328.5*	981541.8*	645601.4*	524478.1	372632.7	180299.6	95373.69

b). Unit costs and volume

Volume indicator / *Unit costs*	*STIs referred*		*STIs treated*		*Condoms*		*1st contacts*		*All target group contacts*		*All contacts*	
	max	*min*	*max*	*min*	*max*	*min*	*max*	*min*	*max*	*min*	*max*	*min*
Number of obs	17	17	14	14	17	17	15	15	11	11	11	11
	Linear											
F(1, 15)	23.14	18.23	24.75	13.82	4.32	4.16	5.82	5.89	7.65	7.71	7.2	5.92
p	0.0002	0.0007	0.0003	0.0029	0.0552	0.0593	0.0313	0.0305	0.0219	0.0215	0.0251	0.0378
Adj R-squared	0.5805	0.5184	0.6463	0.4964	0.1719	0.1651	0.2563	0.2589	0.3992	0.4016	0.3825	0.3298
Volume	-3.904273*	-2.261835*	-4.048936*	-2.942135*	-0.0000466**	-0.0000308**	-13.43035*	-8.757796*	-0.0248959*	-0.0188527*	-0.0144089*	-0.0111297*
Constant	4934.539*	3245.167*	5318.132*	3978.008*	24.42113*	16.77725*	16377.15*	10845.9*	407.9544*	320.999*	312.5098*	249.4135*
	Quadratic											
F(2, 14)	56.65	19.99	19.34	7.42	8.03	7.01	9.59	9.64	7.44	6.1	3.56	2.72
p	0	0.0001	0.0003	0.0091	0.0048	0.0078	0.0032	0.0032	0.015	0.0246	0.0784	0.1253
Adj R-squared	0.8743	0.7036	0.7383	0.497	0.4678	0.4291	0.551	0.5525	0.5629	0.5051	0.3385	0.2564
Volume	-13.02101*	-6.835186*	-10.81672*	-6.310332**	-0.0002117*	-0.0001364*	-48.98499*	-31.81001*	-0.0898646*	-0.0612731	-0.0318991	-0.0191312
Volume sqd	0.0069817*	0.0035023*	0.0053206*	0.002648	0.0002052*	0.0001313*	0.0188397*	0.0122149*	0.00000353**	2.31E-06	8.27E-07	3.78E-07
Constant	6980.985*	4271.753*	6700.545*	4666.009*	38.54744*	25.81471*	28247.79*	18542.36*	617.0273*	457.5102*	377.8184*	279.2912*

Appendix 15: Correlation matrices of the variables used in the econometric cost function estimation

a) Correlation matrix of the variables used in the analysis of the case study data set*

	Total cost	*Rent*	*Coverage*	*Project age*	*Funding agency*				*State*	
					CAPACS	*CCOORR*	*TNSACS*	*APSACS*	*Andhra Pradhesh*	*Tamil Nadu*
Total cost	1									
Rent	0.7446	1								
Coverage	0.4587	0.3784	1							
Project age	0.1238	0.2053	-0.3703	1						
CAPACS	.	.	.	.	.					
CCOORR	.	.	.	.	.	.				
TNSACS	.	.	.	.	.	.	.			
APSACS	.	.	.	.	.	.	.	.		
Andhra Pradhesh	.	.	.	.	.	.	.	.	.	
Tamil Nadu	.	.	.	.	.	.	.	.	.	.

* Due to sample size (n=16), valid correlation coefficients could not be generate for a number of the dummy variables

b) Correlation matrices of the variables used in the analyses of the financial dataset

(i) Full sample

	Total cost	*Rent*	*Coverage*	*Vulnerable group*	*Project age*	*"Agency": Management agency at recruitment of NGO & batch of recruitment**					*Funding Agency*
						APSACS1	*APSACS2*	*HHP*	*SMA1*	*SMA2*	
Total cost	1.0000										
Rent	0.3510	1.0000									
Coverage	0.2933	0.0064	1.0000								
Vulnerable group	0.1752	0.3785	-0.3753	1.0000							
Project age	0.2124	0.1589	0.2956	0.2181	1.0000						
APSACS1	0.1900	0.3296	-0.1818	0.8433	0.5265	1.0000					
APSACS2	-0.1626	-0.1724	0.0634	-0.4714	-0.3891	-0.5590	1.0000				
HHP	0.1224	0.0031	0.5590	-0.1333	0.6714	0.2530	-0.1414	1.0000			
SMA1	0.1680	0.2560	-0.2185	0.5568	0.6563	0.5916	-0.3307	-0.0935	1.0000		
SMA2	0.0119	0.1651	-0.3008	0.5963	-0.3350	0.5657	-0.3162	-0.0894	-0.2092	1.0000	
Funding Agency	0.1900	0.3296	-0.1818	0.8433	0.5265	1.0000	-0.5590	0.2530	0.5916	0.5657	1.0000

(ii) Vulnerable group only

	Total cost	*Rent*	*Coverage*	*Project age*	*Agency & batch of recruitment**		*Target group*			
					SMA1	*SMA2*	*MSM*	*CSW*	*Street children*	*Trans-genders*
Total cost	1									
Rent	0.6155	1								
Coverage	0.3799	0.3172	1							
Project age	0.3302	0.1439	0.1918	1						
SMA1	0.3302	0.1439	0.1918	1	1					
SMA2	-0.3302	-0.1439	-0.1918	-1	-1	1				
MSM	-0.0753	0.3617	0.2572	-0.3015	-0.3015	0.3015	1			
CSW	-0.0294	-0.1284	-0.6539	0.0917	0.0917	-0.0917	-0.4699	1		
Street children	0.1628	-0.0126	0.6943	0.2236	0.2236	-0.2236	-0.1348	-0.6969	1	
Trans-genders	-0.1326	-0.1848	-0.1633	-0.2085	-0.2085	0.2085	-0.0629	-0.3249	-0.0933	1

(iii) Non-vulnerable group

	Total cost	*Rent*	*Coverage*	*Project age*	*Agency & batch of recruitment**		*Target group*	
					APSACS1	*APSACS2*	*Slum dwellers*	*Truckers*
Total cost	1							
Rent	0.2087	1						
Coverage	0.3978	0.1361	1					
Project age	0.1262	0.0533	0.5099	1				
APSACS1	0.0898	0.0254	0.2935	0.8255	1			
APSACS2	-0.1037	0.009	-0.1506	-0.4204	-0.3407	1		
Slum dwellers	-0.2884	-0.0851	-0.7224	-0.2959	-0.141	0.0946	1	
Truckers	0.2884	0.0851	0.7224	0.2959	0.141	-0.0946	-1	1

* Prior to 2001, the targeted interventions were funded and managed by 3 different projects – Andhra Pradesh State AIDS Control Society (APSACS); Department for International Development UK (DFID) supported Healthy Highways Project (HHP); and the DFID supported State Management Agency (SMA). The dummies represent these 3 different projects and that both APSACS and SMA recruited NGOs in 2 separate batches.

Appendix 16: Themes used in the analysis of the transaction cost data

Themes used in the analysis of the transaction cost data:

SERVICE CHARACTERISTICS

ORGANISATION CHARACTERISTICS

- NGO motivation
- NGO capacity
- NGO behaviour
- NGO staff motivation
- Agency motivation
- Agency capacity
- Agency behaviour

INSTITUTIONAL ENVIRONMENT

- Competition

TRANSACTION CHARACTERISTICS

- Contract development
- Contract renewal
- Length of contract
- Contract
- Fund flows
- Contract breach
- Relationships with agency

SCALING UP

Appendix 17: Example of an NGO recruitment advertisement

TAMIL NADU STATE AIDS CONTROL SOCIETY, CHENNAI - 600 008

TARGETTED INTERVENTIONS

Calling For Fresh Proposals From Non Governmental Organisations (NGOs) To Implement Behavioral Chang Projects

Tamil Nadu State AIDS Control Society invites fresh proposals from NGOs to carryout STD/HIV/AIDS interventions in certain parts of Tamil Nadu. The risk prone locations were listed below.

DISTRICTS	TYPE OF INTERVENTION	LOCATION
KANYAKUMARI	❖ STD/RTI Intervention	❖ Kanyakumari town and Surrounding areas
	❖ General Intervention	❖ Kalakkavilai and Aramozhi
THIRUNELVELI	❖ STD/RTI Intervention	❖ Thirunelveli city
	❖ Gneral Intervention	❖ Panaikulam, Radhapuram areas
TUTICORIN	❖ Industrial Intervention	❖ Tuticorin Industrial Zone
	❖ Industrial Workers and Sex Workers Intervention	❖ Kovilpatti area and surroundings
RAMNAD	❖ General Intervention	❖ Rameswaram and surroundings
SIVAGANGA	❖ Intervention for Migrants Workers	❖ Manamadurai town sand adjoining areas
THENI	❖ STD/RTI Intervention	❖ Cumbam and adjoining area
DINDIGUL	❖ STD/RTI Intervention	❖ Dharapuram and surroundings
DHARMAPURI	❖ General Intervention	❖ Dharmapuri and surroundings area
VELLORE	❖ Industrial workers Intervention	❖ Arakonam and surroundings
VIRUDHUNAGAR	❖ Industrial workers and CSWS	❖ Sathur Industrial Zone
MADURAI	❖ General Intervention	❖ Sellour, Thathaneiry surroundings
TRICHY	❖ General Intervention	❖ Thiruvarampur and surroundings
	❖ STD/RTI Intervention	❖ Ponmalaipatty and surroundings areas
PUDUKOTTAI	❖ General Intervention	❖ Annavasal and surroundings
PERAMBALUR	❖ STI Intervention	❖ Perambalur and surroundings
THANJAVUR	❖ Tourist Intervention	❖ Thanjavur Town
ARIYALUR	❖ General Intervention	❖ Ariyalur and adjoining area
NAGAPATTINAM	❖ General Intervention	❖ Nagapattinam and surroundings
TIRUVARUR	❖ Sex Workers & Truckers Intervention	❖ Tiruvarur and surroundings
THE NILGIRIS	❖ Hill area Intervention	❖ Ooty, Gudalur
ERODE	❖ Industrial Intervention	❖ Erode and Surroundings
	❖ STD/RTI Intervention	❖ Thalavady, Bhavani Sagar
NAMAKKAL	❖ Hill area Intervention	❖ Kolli Hills and Other villages
	❖ General Intervention	❖ Thiruchengodu and surroundings
SALEM	❖ General Intervention and Hill area Intervention	❖ Yercaud and surroundings
	❖ Migrant workers Intervention	❖ Chinna Salem and surroundings
TIRUVANNAMALAI	❖ Tourist Intervention	❖ Tiruvannamalai and suurroundings
	❖ Hill area Intervention	❖ Jawathu Hills
KANCHEEPURAM	❖ Industrial workers Intervention	❖ Penpheral areas adjoining to Kancheepuram and near to Chennai
VILLUPURAM	❖ Truckers and General Intervention	❖ Highway from Chengalpattu to Dindivanam
	❖ STD/RTI Intervention	❖ Villupuram Town area
THIRUVALLORE	❖ Industrial Intervention	❖ Peripheral areas of Chennai City

- **Following criteria will be adopted for selection of NGO.**

1. NGO should have three years of working experience and should be a Registered Body of Trust or Society.
2. Importance to NGOs who are operating in that area.
3. NGO should not be a block listed one by any Organisation/Government.
4. NGO should have experience in HIV/AIDS/ & STD/RTI aspects or Health related issues and should have capability to implement the project.

NGOs may send proposals to Tamil Nadu State AIDS Control Society on or before 31st July 2001. Any other information may be sought from NGO Advisor, TNSACS.

PROJECT DIRECTOR
TNSACS

DIPR/757/DIS/2001

THE NEW INDIAN EXPRESS

Appendix 18: Monitoring indicator requirements

INSPECTION REPORT, JART TEAM
(BEFORE RELEASING 40% BEING II INSTALMENT)

1.Name of the NGO :

2. Address of the NGO :

3. Priority Group :

4. Target Area (Block / Taluk / District) :

5. *COMMENTS*

(1) Staff (As per Attendance Register)

Staff Sanctioned (Designation)	Positioned (Name)	Qualification	Training (Details)

(2) Activities Performed

Activities	Cumulative as on Date
a) No. of Persons Contacted	
b) No. of Interpersonal Communications made	
c) No. of Condoms Distributed	
d) No. of Condom Demonstrations Conducted	
e) No. of Condom Outlet Established	
f) No. of STD Cases Identified	
g) No. of STD Cases Referred	
h) No. of STD Cases Treated	
i) No. of Counselling Sessions Conducted	

Activities	Cumulative as on Date
j) No. of IEC Materials Distributed	
k) No. of Cultural Programmes / Street Plays Conducted	
l) No. of Audio Visuals Programmes Conducted	
m) No. of Group Discussions Conducted	
n) No. of Peers Identified and Trained	
o) No. of Peers Recruited	
p) No. of Review Meetings Conducted	

6. *DESCRIPTIVE REPORT*

(a) Capacity of the Staff :

(b) Comments about the Programmes/Processes/ Outcomes :

7. *RECORDS MAINTENANCE*

S.No.	Particulars	Well Maintained	Maintained Satisfactorily	Should be Improved
1.	Attendance Register			
2.	Condom Stock Register			
3.	Condom Issue Register (Staff)			
4.	Condom Issued at Field			
5.	STD CASES : (a) Identified (How many Persons)			
	(b) Follow Up			
	(c) Treatment Note			
	(d) Stock Register (Medicines)			
	(e) STD Attendance Register (Persons attended)			

S.No.	Particulars	Well Maintained	Maintained Satisfactorily	Should be Improved
6.	COUNSELLING ATTENDEES REGISTER :			
	(a) Type of Counselling			
	(b) Follow Up			
	(c) Referral if any			
7.	Diary for all the Staff			
8.	MINUTES BOOK :			
	(a) No. of Meetings conducted			
	(b) Places conducted			
	(c) Persons attended			
	(d) Purpose of the Meeting			
9.	IEC MATERIALS DISTRIBUTION			
	(a) Number			
	(b) Persons			
	(c) How often ?			

8. Project Period : From : / / . To : / / .

9. Date of Visit :

10. *FINANCIAL APPRAISAL* :

Period of Visit	Vouchers, Auditors Statement Submitted or Not	Quarterly Progress Report Submitted or Not	Discrepancies Communicated & Rectified or Not
Ist Qtr (From / / To / /)			
IInd Qtr (From / / To / /)			
IIIrd Qtr (From / / To / /)			
Ivth Qtr (From / / To / /)			

11. Baseline Survey (Conducted or Not and Report sent or Not) :

12. Annual Report Submitted :

13. Bank Account (Date of amount withdrawal) :

14. Places of Visit

Office :
Field :

15. Over all Remarks :

16. Suggestions :

NAME , ADDRESS AND TELEPHONE NUMBER OF THE TWO JART MEMBERS :

SIGNATURE OF THE TWO JART MEMBERS :

Appendix 19: Contract between APSACS and HLL for the Formation of the TRU

Contract between APSACS and HLL for the Formation of the TRU (Extract from TRU Briefing Note)

The important terms of the contract are mentioned below:

Duration of the Contract

The Contract will be deemed to have commenced on (**1st June 2001**) and unless terminated earlier in accordance with the provisions, will continue in force until (**31st March 2004**).

APSACS (key) Duties and Responsibilities

APSACS will have overall responsibility for the management of the Grant Funds and implementation of the HIV/AIDS Control Programme in accordance with the terms of the approval from NACO

Work with the Project Steering Committee to develop overall policies and objectives for technical assistance for HIV/AIDS Control Programme

Approval of the Quarterly Programme Plan submitted by TRU and transfer of the funds needed for implementing the approved plan on time

Monitor and audit the performance of the Technical Resource Unit, and in particular, its role in the progress of the NGO/CBO sector programme and its financial management and the accounts relating to;

Subject to the provisions, ensure that each installment of the Grant Funds is released as advance to the Partner organisations for every six months activities.

Carry out an assessment of the Technical Resource Unit's performance against the Performance Indicators each Project Year on behalf of the Project steering Committee

HLL's (key) Duties and Responsibilities

Facilitate and support the TRU which will provide technical assistance in implementing HIV/AIDS Control programme, perform and observe HLL's obligations under the Contract and operate the Technical Resource Unit as an independent entity within HLL, as far as is possible;

Engage other suitably qualified staff and consultants as are necessary for the Technical Resource Unit to achieve its objectives, obtaining the approval of the APSACS prior to any appointments;

Complete a draft programme plan and a budget for the TRU in conjunction with the APSACS for the Project Year and present it to the Project Steering Committee by a date, which is mutually agreed. The administrative budget for the contract period of three years will be as already agreed upon.

Provide the secretariat for the Project Steering Committee and ensure that meetings are held on a regular basis in accordance with the procedures agreed by the Project Steering Committee. The last meeting of each Project Year should be held at least 8 weeks before the Project Year end unless agreed otherwise;

Provide the Project Steering Committee with copies of the following for the TRU:

- Quarterly progress reports
- Quarterly financial reports
- The annual programme plan
- The annual progress report
- The annual financial report
- The annual budget
- The annual audited accounts

so that they are available for consideration at the respective Project Steering Committee meetings and can be used to monitor the performance of the Technical Resource Unit;

Provide APSACS with the following by the tenth day of the following month:

- A monthly expenditure statement together with supporting documentation for the Technical Resource Unit's activities; and
- A brief monthly progress report for the Technical Resource Unit's activities

Prepare the quarterly and the annual progress reports for the TRU. The annual progress report should describe the progress which the HIV/ AIDS Programme has made towards meeting the respective programme plan objectives, contain information on the activities carried out, the problems encountered and the results of the monitoring and evaluation which the Technical Resource Unit has carried out;

Appendix 20: Training programmes implemented by the TRU

Training programme	*Batches*
Components of Targeted Intervention (SW Project)	3
MIS & FM	6
STD Counselling	9
Condom social marketing	9
Book Keeping & Accountancy	11
Communication material development workshop	5
Orientation Meeting for local facilitators	3
Female condom	1
STD/HIV/Counselling	1
Syndromic Case Management	1
Program support for Project Managers	5
Counsellors Training	2
Outreach Workers Training	1
	57

Source: TRU quarterly reports

Appendix 21: Funding delays experienced by APSACS NGOs

NGO	Years of intervention	Delay 1	Delay 2	Delay 3	Delay 4	Delay 5	Delay 6	Delay 7
		(months)						
19	2	6	3	2	1	2	6	
9	4	none reported						
4	4	3	3	3				
15	4	6	3	0.2	0.8	2	2	5
2	4	4	6	4	5	7	4	4
3	4	8	3	5	8	5	5	4
10	2	5						
5	3	4	4	4	7	7		
12	5	none reported						